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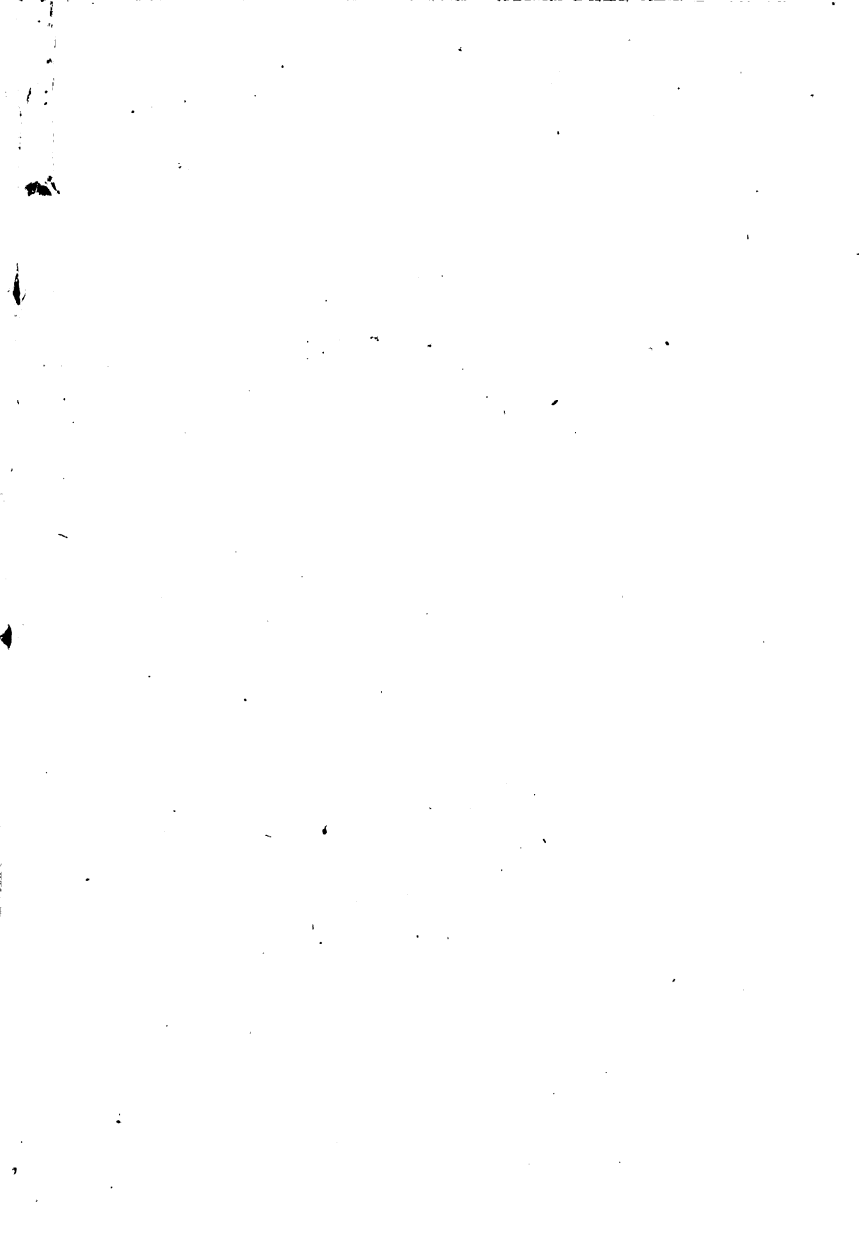


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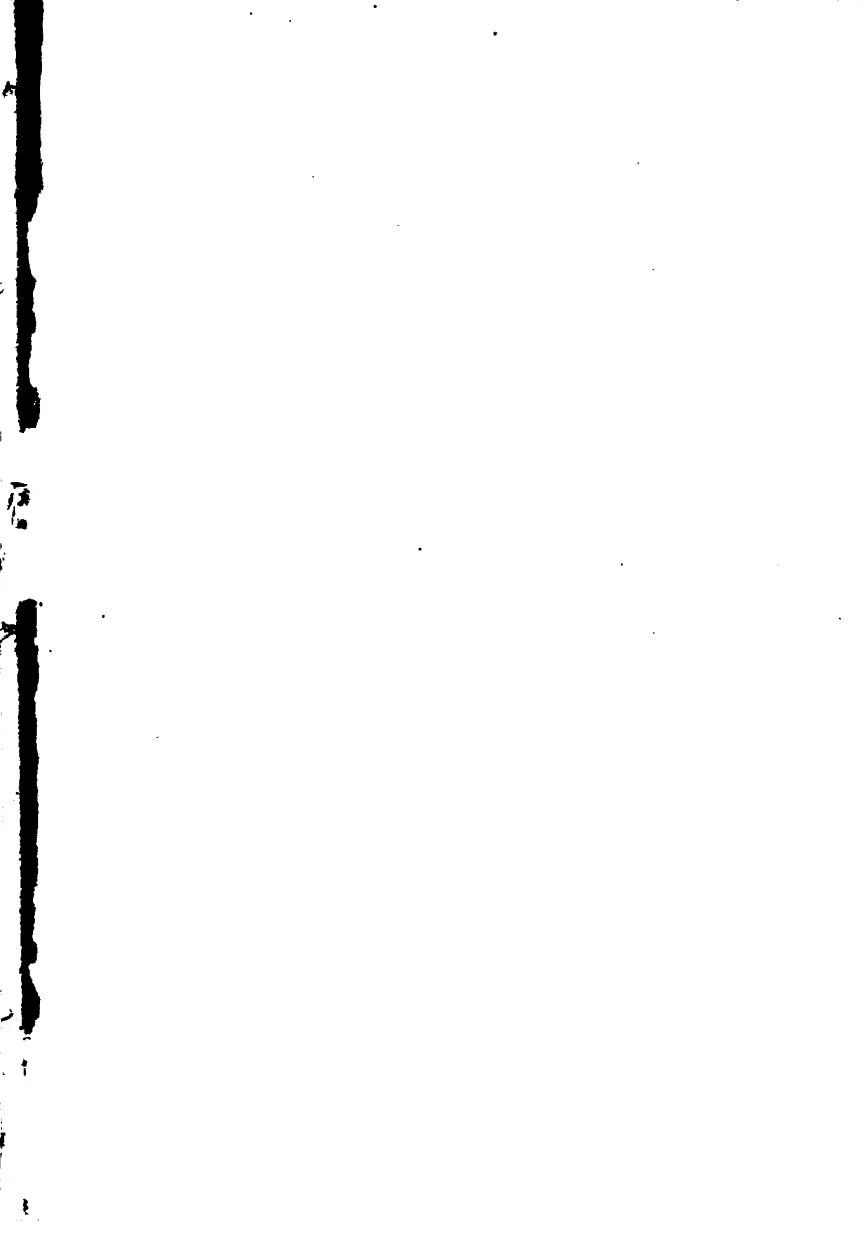
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# HOME SANITATION

A  
MANUAL FOR HOUSEKEEPERS

BY THE

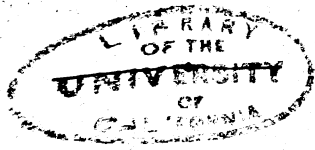
*Richards, E.*

SANITARY SCIENCE CLUB

OF

THE ASSOCIATION OF COLLEGIATE ALUMNI

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## PREFACE.

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THE Sanitary Science Club of the Association of Collegiate Alumnae was organized in November, 1883, for the study of home sanitation. Two years were devoted to general study and research before any attempt was made to extend the work beyond the limits of the club. Since that time the material now presented has gradually taken form. The questions have been practically tested by the members of the club in their own homes and by other housekeepers. The questions have also been adopted as the basis of a course in sanitary science offered by the Society to Encourage Studies at Home. The practical sanitary work accomplished by the club, both for themselves and for others, cannot be mentioned in detail. But as an encouragement to the formation of similar clubs, and to the study of the subject, it may be said that the expenditure of time and effort has been amply repaid by positive and satisfactory results.

Since its organization the membership of the club has

undergone several changes. The present active members desire to express their indebtedness to their former associates for much of the preliminary work, without which this little book could not have been made.

ANNIE E. ALLEN,  
ALICE STONE BLACKWELL,  
SARAH LOUISE DAY,  
ALLA W. FOSTER,  
EDITH TALBOT JACKSON,  
ALICE PELOUBET NORTON,  
*Editors,* { ELLEN H. RICHARDS,  
                  { MARION TALBOT.

BOSTON, June 1, 1887.

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### EDITORS' NOTE.

In revising this little volume the chapters on food and clothing have been omitted and those on the country house and sanitary precautions substituted. It is thus confined more strictly to *House Sanitation*, while the daily care and the conditions comprehended under the term *Home Science* are left to be treated fully in another place.

The editors have received helpful suggestions from Mrs. Alice Peloubet Norton, Miss S. Maria Elliott, and Miss Henrietta I. Goodrich.

OCTOBER 1, 1898.

# CONTENTS.

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## CHAPTER I.

	PAGE
Introductory . . . . .	7

## CHAPTER II.

Situation of the House and Care of the Cellar . . . . .	10
Questions . . . . .	12

## CHAPTER III.

Drainage and Plumbing . . . . .	15
Questions . . . . .	19

## CHAPTER IV.

Ventilation . . . . .	31
Questions . . . . .	33

## CHAPTER V.

Heating . . . . .	37
Questions . . . . .	42

## CHAPTER VI.

Lighting . . . . .	46
Questions . . . . .	50

## CHAPTER VII.

	PAGE
Furnishing . . . . .	52
Questions . . . . .	55

## CHAPTER VIII.

The Country House . . . . .	59
House Inspection . . . . .	63

## CHAPTER IX.

Sanitary Precautions . . . . .	65
Questions . . . . .	68

## CHAPTER X.

Sanitary Work for Women . . . . .	71
LIST OF BOOKS OF REFERENCE . . . . .	77
INDEX . . . . .	81



# HOME SANITATION.

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## CHAPTER I.

### INTRODUCTORY.

**T**HE hygiene of the home is a subject of growing importance and interest. As one of the problems of social and economic science it is beginning to receive the attention it may rightly claim. The women of our country should not only follow the discussions which are carried on by sanitary congresses, boards of health, and other authorities, but, by combining theory with practice, as few others can, they should aid in solving the great questions which seriously affect the interests of the home and the family.

The object of this manual is to arouse the interest of housekeepers in the sanitary conditions of their homes. The questions are so framed that an affirmative answer implies a satisfactory arrangement, while the question itself suggests a remedy, if the answer is negative.

In thus pointing out the sources of danger, and the ideal standards of sanitation in the perfectly healthful house, the compilers do not intend unnecessarily to alarm or discourage the householder. It is their aim to urge the intelligent oversight of these matters, and to indicate the points requiring investigation, the methods of examination, and the practical remedies.

The conditions required under the two topics (Situation and Drainage) which open the subject may seem as difficult of realization, especially to those already settled in their homes, as they are important. But while the suggestions would be of greater value to those considering the choice of a residence, yet it is believed that they will show to those who assume the conditions of their houses to be beyond their control that the remedy frequently lies within their reach. The second topic (Drainage) is necessarily somewhat technical; but it is hoped that the explanations in the notes will prove the difficulties to be more apparent than real, and that the principles can be easily understood.

It is unavoidable that some of the points, in a subject so full of detail, should appear in themselves trivial, and the risk to health, incurred in ignoring them, very slight; but the sum of such trifles often makes the difference between physical vigor and weakness, and the risk, small as it is, is greater and more serious than that from fire, against which the householder always insures himself.

One of the most dangerous qualities of the unsanitary house is that it does not always and at once produce a definite and virulent disease, such as typhoid fever or diphtheria, though such is often its result; but, without doubt, it slowly and insidiously causes ill-health and general languor, which incapacitate for sustained effort, and to which women, from their greater confinement to the house, are especially subject.

In conclusion, the householder must be reminded that it is not enough to secure right sanitary conditions; they must be maintained. This can be done best through the eternal vigilance of the housekeeper, who can thus, in large measure,

secure the two essentials of a happy home, — good health and its attendant, good-nature.

The following motto should be the basis of her efforts : —

“ Any invention intended to be a substitute for watchfulness will prove a delusion and a snare.”

The purchaser of a house demands and is willing to pay for obtaining a clear legal title to the property ; there should be the same demand and willingness to pay for a clear sanitary title, *i.e.*, that the house, in all respects, conforms to the best known laws of sanitation. A purchaser or tenant should have as perfect a guaranty of the latter as of the former.

The time must come soon when, in order to sell or let houses, the owners or agents will be required to show a certificate secured through expert examination regarding the perfect sanitary condition of each house. Already some wise landlords show such certificates. In general, however, the purchaser or tenant must look out for this himself, remembering that all expense incurred is for the safety, health, and possibly the lives of his family and himself.

Wherever there is a Board of Health, an Inspector of Buildings, or a Board of Examiners, they may be consulted as to the laws of that town or city, since as yet there is little uniformity as to details. But, because the members of these Boards are not always themselves experts, and because the standard of public opinion does not as yet demand that they shall be, full reliance cannot, in all cases, be placed upon inspection by public authorities.

In houses already occupied, the heating and plumbing systems should be closely watched. If defect is suspected, any person in the house may make a complaint to the Board of Health and inspection will be made without expense.

Given a house in perfect sanitary condition at the start, the housewife should know what is required to keep it in like condition. Barring accidents, cleanness and pure air will usually ensure a condition of safety. She should then know what accidents are liable to happen and how to keep the entire house clean. The object of the following chapters is to give her this knowledge.

## CHAPTER II.

## SITUATION OF THE HOUSE AND CARE OF THE CELLAR.

THE location and surroundings of the house are of the first importance from a sanitary stand-point. Folding-doors and carved mantel-pieces are attractive to the house-hunter; but the satisfaction they give may be more than offset by the bad effects of a neighboring marsh, a wet cellar, or a lack of sunshine. As W. P. Gerhard well says: "It must be constantly borne in mind that, while defective construction may generally be remedied, unhealthy surroundings, an undesirable aspect, or insalubrious building site cannot be changed."

The chief essentials to be secured are pure air, sunlight, and dryness. These are conditions upon which physical and mental vigor largely depend. Without them the human system loses its power of resistance to disease. Rheumatism and consumption are diseases which are peculiarly prevalent under such conditions. Moreover, many forms of organic life, known familiarly to us in the form of decay and mold, thrive only in dampness and darkness.

As to the first of these essentials, pure air, we must consider not only the condition of the air above ground, but also the state of the air which circulates in the ground. We usually think of air as only above ground, not as moving about in it, and seldom realize how great the amount of ground-air is until we try the simple experiment of pouring water into a potful of dry earth, and notice how much water the earth will absorb in the space before occupied

The ground-air is more dangerous than the free atmosphere because it is more apt to be the carrier of foul gases and an undue amount of moisture. Moreover, the materials ordinarily used for the construction of cellar walls are more pervious to moisture and air than is generally supposed. Dry brick, for example, is so porous that it can take up about 25% of its weight of water, and even the finest grain stones absorb some moisture. The following questions suggest methods of keeping dampness and ground-air out of the cellar.

The reader may exclaim, "Why, you would be more particular about the cellar than the parlor!" and she would not be far from right. The day has not passed when a contemplated visit to a cellar is, in many cases, a cause of some trepidation and alarm. There are the breakneck stairs to grope down, and some calculation is needed to land in safety on the board floating about at the bottom. A few steps farther and the intruder may knock her head against a hanging shelf, covered with an accumulation of fragments of food. She decides that a little fresh air would be desirable. She makes her way toward one of the narrow windows through whose covering of cobwebs and dust a few rays of light straggle. The first attempt to open a window is a failure, for the coal-bin forms an impassable barrier; and the second window is as inaccessible, because of the row of old barrels, filled with decaying vegetables and household rubbish, which are placed against the cellar wall. The only other inlet for fresh air is the cellar door, which is too heavy to lift, and the visitor is forced to retreat without fulfilling her good resolve.

For the reverse of this picture, we may refer to the cellar which is not only sanitarily ideal but practically possible.

It is as light and dry and clean as any room in the house. The windows are large, are on different sides, and can be opened easily. The walls are free from dust and cobwebs, and look quite attractive in their coat of whitewash. The sweetness and purity of the air are not only a satisfaction to the good housekeeper when she inspects her cellar, but they have much to do with the well-being of the family.

Much of the air which enters the different rooms of the house comes from the cellar. A heated house acts like a chimney. Not only does it draw in air from the ground through the cellar walls and floor, unless they are made impervious, but the movement of air is from the bottom upwards, and the air of the cellar makes its way into every part of the house. A German experimenter proved that one half of the cellar-air made its way into the first story, one third into the second, and one fifth into the third. The upward movement of air is shown frequently by ceilings. The dark streaks are formed by the deposit of dust from the air which passes through the plastering.

These facts prove the necessity of especially considering the cellar in its function of a reservoir of air for the whole house; and it will be readily agreed that there is little use in adopting special methods of ventilation for the living-rooms and sleeping-rooms, if foul air is allowed constantly to rise from the cellar. Therefore, during most of the year there should be a free circulation of air through screened open windows. In very hot summer days the windows should be closed during the day to prevent the deposit of moisture upon the walls.

#### QUESTIONS.

1. When you selected your house did you make sure that it was in a healthful locality as well as in a convenient and fashionable one?

2. If the house is situated on rising ground, is the surface-water (from rains) carried away on all sides by either natural or artificial drains?

3. If the ground is level, are there under-drains carrying away the rain-water?

4. If the soil is sandy and porous, are special pains taken to exclude contaminations from drains, cesspools, leaky gas-pipes, etc.?

5. If the soil is clayey and compact, is there special provision for drainage?

6. Is there a distance of at least 200 feet between the house and any source of contamination of the air, such as any opening of a sink, or other drain; any deposit of decaying material; any marshy spot, low river bank, or pool of stagnant water?

7. Are the first floor beams of the house laid upon stone or brick foundations, three to six feet above the ground?

*Note.* — Only about half the height of the cellar is then below the surface of the ground.

8. Is there a cellar or ventilated air-space under the whole house?

9. Is there a light and dry room (either under a carriage-house or other building, or walled off from the main cellar and with a separate entrance), in which all vegetables and other perishable articles are stored?

10. Is the cellar perfectly dry at all seasons of the year?

11. If not, are special drains laid under the cellar floor?

12. Are the floors and sides made impervious by cement, asphalt, concrete, or other means?

13. Is the cellar thoroughly cleaned and whitewashed *with lime* every spring?

14. Has the cellar several windows on opposite sides, if possible, so that it is light and well aired?

15. Is care taken to keep the ground outside the cellar windows free from any contamination?

16. Are these windows accessible?

17. Is the cellar lathed and plastered overhead?

18. Is the coal-cellar a light and dry place?

*Note.* — The decomposition of the sulphides in the coal goes on much more rapidly in a damp atmosphere. Sulphides cause silver to tarnish.

19. Do the living-rooms and sleeping-rooms have the sunshine a good part of the day?

*Note.* — Shade-trees often surround the house too closely and prevent the entrance of sunlight, the circulation of fresh air, and the consequent evaporation of moisture.

20. Are all the sleeping-rooms above the first floor?

21. Are there windows on two sides of every room, or suite of rooms, or some other efficient means of producing a strong current of air when needed?

Chiefly applicable to a city house: —

22. Is the street pavement usually clean and dry?

23. Are the gutters clean, and does the water run freely from them to the drain?

24. If the lot is on made land —

(a) Have you consulted old topographical maps, in order to learn the original character of the soil, and direction of the water-courses?

(b) Was the site well drained before the process of filling-in was begun?

(c) Does the soil consist of gravel, sand, or loam, not a mixture of ashes, street-sweepings, and house-refuse?

(d) Have some years passed since the lot was filled in?

25. Is the back-yard provided with a drain for rain water, and is the drain easy of access for cleaning?

## CHAPTER III.

## DRAINAGE AND PLUMBING.

**I**T may be confessed, frankly, at the outset, that drainage and plumbing present some of the most intricate problems with which the housekeeper has to deal; but, for the encouragement of the reader, it may be said that they are like most tangled skeins, — after the first few knots are carefully disentangled the rest of the difficulties vanish almost of themselves. Moreover, there is a special inducement to make a little extra effort; for from defects in this department by far the greater part of the most serious and immediate dangers to life and health in the household arise. In many instances these can be averted, without expense or even technical skill, by intelligent oversight and a knowledge of what defects to look for, how to find them, and how to remedy them.

When an expert is really needed a little knowledge enables one to recognize the fact in season to save the heavy penalty of illness or expensive repairs which delay often involves. In no department of household economy are the old adages about the ounce of prevention and the stitch in time more valuable. These questions aim to save the pound of cure, and avert the nine stitches. They do not aim to supplant the mechanic or engineer, or to supply the place of a scientific treatise.

They are based upon the principles stated by Rogers Field as the three canons of house-drainage: —

1. All refuse matters must be completely and rapidly removed.

2. No passage of air can be allowed to take place from drain or waste-pipes into houses.

3. No communication can be permitted to occur between the drains and the water-supply.

In two ways these questions are designed to be especially helpful.

*First.* To enable those selecting a house to judge of its sanitary condition. It cannot be too strongly urged in this connection that every inch of pipe, every cesspool, every drain and joint and trap, must be seen and tested. If they are so imbedded in wood-work, walls, floors, or ground, as to make this impossible, that fact is, in itself, condemnation enough. Such concealment makes two evils certain, even if everything else is all right at the time. (1.) Because of the trouble or even practical impossibility attending inspection, there will not be the thorough and *periodical* examination of the whole drainage system which safety requires just as much as in the case of the steam-boiler. (2.) A leakage or break is liable not to be discovered until it has produced serious or possibly fatal disease; and then there is often delay, and, eventually, the partial demolition of floors and walls in order to get at the root of the trouble.

*Second.* To aid those in charge of a household to maintain healthful conditions. The larger the staff of servants, and the more complicated the drainage system, the more necessary is intelligent supervision. When the mistress has little realization of the importance of sanitary precautions it is scarcely to be expected that even the most trusty servants will display greater interest, foresight, and intelligence in the daily care of the house. It is difficult to say whether

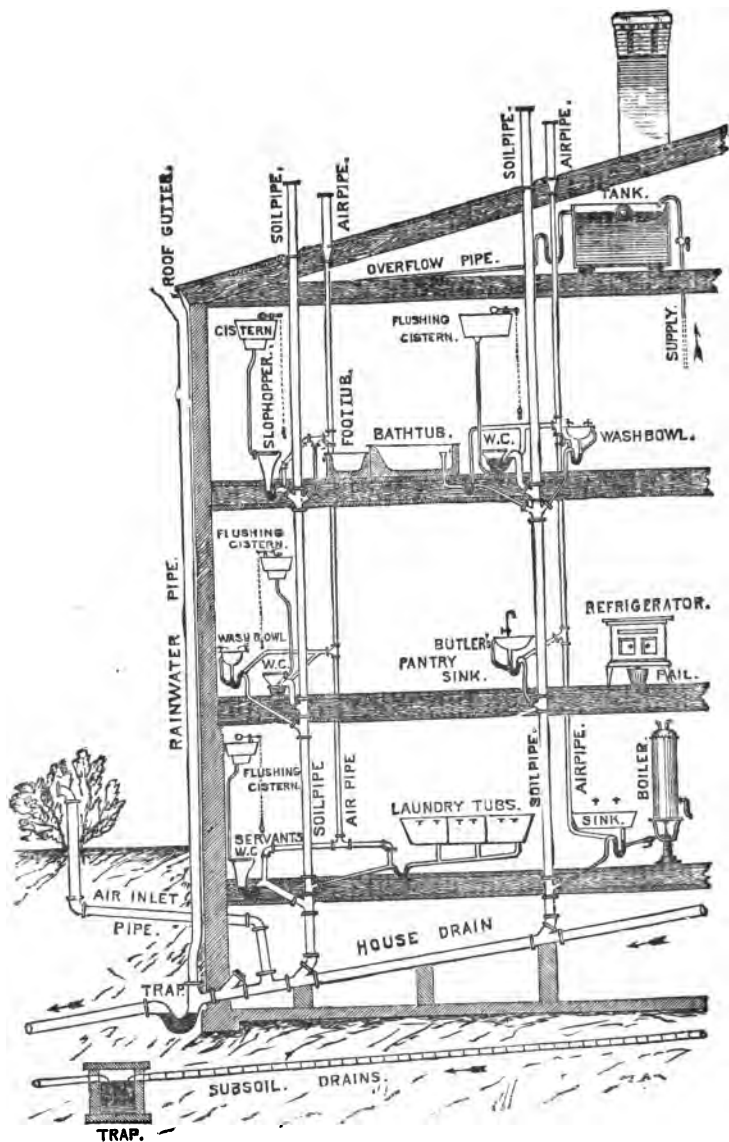
it is more necessary to start right in the beginning with simple and efficient drainage, or to keep it in good condition by watchful, constant attention. The importance of apparent trifles must be felt, and careful regard paid to them. The single match or banana-peel in the closet, the lock of hair in the washbowl, may be the source of serious and expensive trouble.

It will aid in the most intelligent use of the questions if some simple descriptive manual be read in connection with them to serve for further explanation and illustration.

The question of the disposal of sewage outside the immediate premises is beyond the control of the individual, and, therefore, not within the scope of this book. The disposal of sewage where there is no water-carriage system has been touched upon by a few leading questions; but any elaboration of the practical application of the methods suggested should be sought in some treatise devoted to the subject.

In conclusion, we may quote from Mr. J. Pickering Putnam a few general principles of universal application which might be called The Ten Rules of Sanitary Drainage:—

- |                           |  |
|---------------------------|--|
| 1. Simplicity.            | 7. Avoidance of mechanical contrivances. |
| 2. Accessibility.         | 8. Automatic operation.                  |
| 3. Soundness of material. | 9. Economy of water.                     |
| 4. Tightness of joints.   | 10. Noiselessness.                       |
| 5. Ventilation.           |  |
| 6. Thorough flushing.     |  |



## QUESTIONS.

1. Have you a plan of the system of pipes in your house? (See W. P. Gerhard's diagram on preceding page.)

2. Is all the plumbing-work exposed to view, or easily accessible?

3. Are the fixtures on the different floors placed over each other so as to avoid horizontal soil and waste pipes?

*Note I.* Fixtures include water-closets, washbowls, tubs, sinks, etc.

*Note II.*— The *soil-pipe* conveys the contents of water-closets and urinals to the house-drain. It may also receive the contents of waste-pipes. The *waste-pipes* carry other refuse fluids, as of tubs, sinks, washbowls, etc., only. These pipes may discharge either directly into the house-drain, or into the soil-pipe. The *house-drain* is the pipe which receives the contents of the soil and waste pipes, and conveys them outside the house. It is nearly horizontal, with an inclination of at least one in fifty, while the soil-pipe should be vertical.

4. Are all the pipes air-tight as shown by the peppermint or other reliable test?

*Note.*— Pour two ounces of oil of peppermint into the soil-pipe at its mouth above the roof, if it is accessible, or into the basin or water-closet nearest the roof, first closing the vent-pipes which appear above the roof. Pour in, immediately after, a pailful of hot water; if the odor of peppermint is perceived, at any lower fixture, it is an indication that there is an opening in some pipe through which foul air may escape. The peppermint should be kept outside the house until needed, and the person who pours it in should remain on the roof, or in the room with closed

doors, until the examination of the fixtures below has been made by assistants; otherwise, the odor will come from the bottle, or the clothing of the person, and spoil the test.

Oil of peppermint is sold for the purpose in 2-ounce vials, hermetically sealed.

5. Is the continuation of the house-drain outside the house to the sewer or cesspool properly laid, *i.e.* —

(a) Are the pipes of small size, not more than five inches in diameter, in order that they may be thoroughly scoured by the rush of water?

(b) Are they laid with a continuous grade of at least one in fifty?

(c) Have they tight joints?

6. If this outside drain is in made ground, or quicksand, or near trees, or a well used for drinking, is it made of iron? If otherwise, if not of iron, is it of earthenware, with cemented joints?

7. Is there a trap on the house-drain, near the cellar wall, to prevent the entrance of foul air from the sewer?

(a) Has this trap a cleaning-hole so that it can be reached and cleaned?

(b) Is care taken to close the cover of this cleaning-hole perfectly air-tight after each examination?

*Note.* — A trap is a bend in a pipe, with or without an enlargement, which retains a sufficient quantity of the water that passes through it, to prevent the passage of foul air back through the pipe, and into the room. There are many kinds of traps. The S trap, Fig. 136, and the bottle-trap, Fig. 139, are in common use.

The water standing in the trap is called the seal. It is effective when it stands at least one inch above the bend in

the pipe. If it stands lower space is left above the water for the passage of foul air back through the pipe, and the seal is "broken," as in Fig. 137.

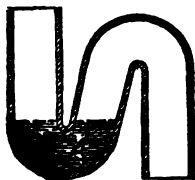


Fig. 136.



Fig. 139.

A trap, to be effective, must be of such a size and shape that it will be self-cleansing. If the water-seal is too deep, solid matter will not all be carried out of the trap.

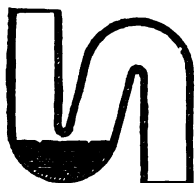


Fig. 137.

8. Is there a pipe for the admission of out-door air on the house side of this trap? (Question 7.)

*Note.*—Air admitted here will pass up through the house-drain and main soil-pipe, diluting and carrying off at the roof the foul air in these pipes.

(a) Is the opening of this pipe at least ten feet from a window, door, or the cold-air supply of any heating apparatus, lest a counter-current should carry the foul air back through the fresh-air pipe?

(b) Is the fresh-air inlet at least as large as the drain, four inches in diameter?

(c) Is its opening protected from obstructions?

9. Is the house-drain carried in full sight along the face of the cellar-wall, or suspended from the cellar-ceiling?

*Note.*— If there are fixtures necessitating the laying of the pipe at a lower level than the cellar, the drain should be laid in a mason-work trench (or on special foundations, in filled-in land), under the cellar-floor, with movable covers, that leakage in the joints of this important pipe may be surely and quickly detected.

10. Is the drain protected from the settling of the cellar-walls by an opening, arched or crossed with a long stone where it passes through them?

11. Is the soil-pipe —

(a) As small as four inches in diameter?

(b) Carried in a straight line at least two feet above the roof for ventilation, with its opening away from windows, chimney-flues, and fresh-air ventilators?

(c) Protected at its opening by a wire-screen from the entrance of leaves and other obstructions?

(d) Made of cast-iron with calked lead joints, and coated inside and outside with asphalt or some equivalent substance?

12. Do the branch waste-pipes connect by a Y branch and  $\frac{1}{8}$ -in. bend with the soil-pipe?

*Note.*— A Y branch is so named from its shape.

13. Has each water-closet, washbowl, bath-tub, sink, set of laundry tubs, etc., a separate trap, and *one* only?

*Note.*— If a fixture has two traps, or if there are two traps on the same length of pipe, the air between them may be so compressed that it will force its way through the trap having the shallower water-seal. This is the cause of the irregular gurgling sound sometimes heard. It may be remedied by removing one trap, or by connecting the crown of one of the traps with a ventilating-pipe, as is now usually done with all traps.

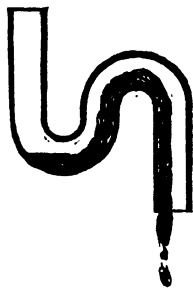
14. Are the fixtures as free from woodwork in the form of casings, etc., as possible?

(a) If not, can the woodwork concealing them be easily removed, and is it frequently removed for the examination and cleaning of the fixtures?

15. Does each water-closet have a sufficient supply of water, discharged with enough force when emptied, completely to scour the traps and branch waste-pipes, *i.e.*, two or three gallons to each closet at each flushing?

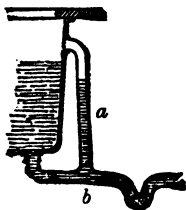
16. Are all objects excluded from the water-closet which are likely to obstruct the pipes, such as hair, strings, rags, china, glass, or anything not quickly and easily dissolved? *Note.* — See cut.

17. Are the water-closets flushed with water from a special cistern used for that purpose alone, and never as a supply for drinking or cooking, or for the hot-water system?



18. When a fixture is not to be used for some time is the evaporation of water in its trap, which would destroy the seal and admit foul air to the house, prevented by pouring down oil, so as to cover the water in the trap, or is the water replaced by glycerine?

19. Are all stationary lavatories excluded from sleeping apartments, unless special precautions are taken?

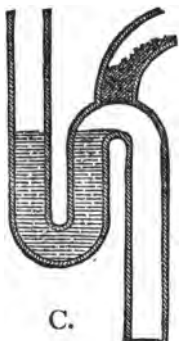


20. Are concealed overflow-pipes avoided, and standing overflow-pipes or some substitute used? If the overflow-pipes (a) are concealed, are they frequently flushed with clean water? Do they connect with the waste-pipe between the bowl and trap (b)?



21. Is siphonage of traps guarded against by ventilating-pipes, pot-traps, or mechanical traps?

*Note.* — When a body of water with considerable momentum is discharged into a pipe (as in emptying a pail of slops or flushing a water-closet) it drags air along with it, and partially exhausts the air in all the branch pipes. The pressure of the atmosphere outside the pipe, upon the water in the trap, will then be greater than that from inside the pipe, and the water in the trap will be forced down into the pipe, until the water-seal is broken, and space left for the passage of foul air up into the room.

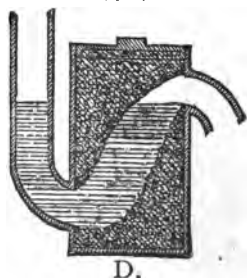


The vent-pipe is an air-pipe attached to the highest part of the bend in the trap, on the sewer side of the water-seal, thus affording free admission of air to the inside of the pipe, to balance the pressure of the atmosphere outside and preserve the water-seal, when the air in the branch waste-pipes has been swept away by a discharge of water. The opening sometimes becomes clogged, as in the cut C.

Vent-pipes are usually required by plumbing laws.

A pot-trap is one like Fig. 139 (Question 7, note), with a chamber large enough to hold a deep water-seal which cannot be easily broken. A small pot-trap will not resist siphonage, but a large one will. These traps, however, retain filth, and are liable to clog. (See cut D.)

Mechanical traps are those having, in addition to the water-seal,



some mechanical contrivance, as valve, ball, flap, etc. They are liable, from their complicated construction, to get out of order; they are not self-cleansing, and accumulate deposits.

In view of these objections it is generally considered best to use vent-pipes with water-closet traps; and bottle-traps, frequently cleaned out, under sinks, basins, and tubs.

22. If the vent-pipe is used, is it (a) either extended through to the roof and two feet above it, entirely separate from any chimney-flue, or branched into a soil-pipe above the inlet from the highest fixture?

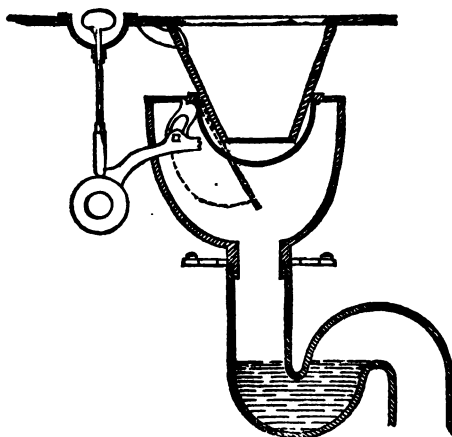
(b) Is it either vertical or continuously sloping, to avoid collection of water by condensation?

(c) Is the main vent-pipe at least three inches, and the branch vent-pipe two inches, in diameter?

23. Are slop-hoppers thoroughly flushed after each use?

24. Is their outlet provided with a strainer?

25. If a water-closet is used as a slop-hopper, is it invariably a hopper or wash-out closet, without woodwork except the seat on the top?



*Note.* — Pan, valve, and plunger closets should never be used for slops.

26. Is the old-fashioned pan-closet (Fig. 145), which is condemned as clumsy and unsafe by all sanitarians, replaced by some one of the numerous simpler and more effective modern closets?

*Pan Closet.*

The upper bowl is set into a large container; a copper pan closes the bowl at the bottom. The dotted lines show the position of the pan when open. The contents of the bowl are discharged by tilting the pan by the lever. It is a complicated apparatus, and likely to get out of order.

*Objections.*

Its container is inaccessible. This container becomes foul, and the flush of water cleanses it very imperfectly. The flush is usually not strong enough to drive the solid matter over the bend of the S trap in the pipe. The foul air from the decomposition of this filth escapes into the room every time the closet is used and the water-seal in the pan is broken; it also escapes through the lever-hole when not in use. Even if these objections are obviated by a special flushing apparatus for both bowl and container, by fresh-air pipe and vent-pipe, and by enamelling the container, the only merit which can be claimed for it is that of cheapness.

The essentials of a sanitary closet are rapid and free flushing; a deep water-seal; avoidance of siphonage; simplicity of construction; accessibility for cleansing and inspection. There are many modern fixtures which fill these conditions.

27. If a grease-trap is provided for the kitchen sink, is it frequently cleaned and inspected?

*Note.* — Grease carried from the kitchen sink by hot water soon becomes cold, and adheres to the sides of the pipe and trap, unless the drain has a very good pitch. A special trap

placed near the sink to intercept the grease before it congeals is called a grease-trap. If there is no grease-trap the sink should be frequently washed out with a hot solution of washing-soda, or potash. This is more effective if done at night after all other work is finished.

28. Is the space under the kitchen sink free to light and ventilation, and accessible for frequent cleansing?

29. Are all articles excluded from the sink-pipe which are likely to obstruct it? (Question 16.)

30. Is the refrigerator waste-pipe free from direct connection with the soil-pipe or drain?

31. Is it discharged by a pipe opening above a sink in the basement, or emptied on the ground in such a way that it drains off quickly?

32. If the sink is used, is the waste-pipe from this sink effectively trapped before entering the drain?

33. Are the waste-pipes which lead from the sheet-lead safes provided under basins, tubs, water-closets, etc., to prevent flooding of floors and ceilings, not directly connected with the soil-pipe or drain, but discharged into an open sink in the cellar, or over water-closet cisterns?

34. Are the overflow-pipes of all cisterns used for drinking, cooking, or washing, free from direct connection with the soil-pipes.

35. Are they either discharged on the roof, or over an open sink, etc., as above?

36. Are rain-water leaders used for that purpose only, and never as soil, waste, or ventilating pipes?

37. If, unhappily, the leader does discharge into the drain and its top opens within ten feet of a window, is it trapped at the bottom, just before entering the drain?

*Note.* — When the contents of these waste-pipes (in

Questions 30-37) are eventually discharged into the drain they are of great assistance in flushing the pipe. The disconnection by trap and at the open sink reduces to a minimum the danger of back passage of foul air.

When these wastes are discharged directly into the soil, they are liable to cause standing puddles, gut lawns, and increase the dampness about the house and the possibility of dampness in the cellar.

38. After sinks and bowls have been used is fresh water turned on to fill the traps and displace the dirty water which would otherwise stand in them?

If the house has not the water-carriage system : —

1. Are earth-closets, ash-closets, the pail system, or some method of frequent removal and disinfection adopted?

2. If not, is the receptacle of the privy cemented to prevent leakage and soakage, and to permit the complete removal of its contents?

3. Is the receptacle accessible from outside the house?

4. Is the closet separated from living-rooms and sleeping-rooms by a ventilated passage-way protected from storm and cold?

5. Is a box of dried and sifted loam placed near, and enough thrown in after each use to keep the contents dry?

*Note.* — Gravel and sand are useless for disinfection.

6. Is a separate receptacle and drain provided for slops and other fluid wastes?

*Note.* — The efficacy of earth depends on its deodorizing and absorbing properties, which exist only when it is dry; hence, if slop-water is poured into the receptacle, a larger amount of earth is needed to absorb it, and prevent decomposition, than can be conveniently used.

7. Are you careful not to throw slop-water frequently on the same spot of ground near the house?

8. Is an absolutely tight receptacle substituted for the common cesspool?

*Note.* — The common cesspool is lined with bricks or stones so loosely laid that the noxious gases which are generated, and the liquid contents, escape into the soil. The gases are liable to make their way back into the drainage system of the house. They permeate the ground, and, if the cesspool is near the house, pollute the cellar air. The liquid contents spread through the soil, and contaminate the water of wells and springs, even at great distances. In these different ways the cesspool may be the means of breeding and spreading disease. It is, therefore, not only a constant source of danger to the immediate household, but is always objectionable in the interest of public health. Its use is entirely prohibited by sanitarians.

9. Is this receptacle emptied (*a*) by a flush-tank through an impervious pipe, into a series of earthen or tile drains with open joints, and its contents discharged into the ground a short distance below the surface? Or, (*b*) are its contents carried through an impervious pipe, and emptied on the surface of the ground at a distance from the house or a source of water-supply? and is the position of the outlet of the pipe occasionally changed?

*Note.* — (*Vide a.*) Flush-tanks are self-emptying, tight cesspools, small in size, and made automatic in various ways. They are thus emptied intermittingly. By this action the liquid is forced more rapidly through the pipes and they are prevented from being choked. The sewage is also more widely distributed and has time to subside, instead of keeping the ground a little wet all the time; the

air can then enter, and the aerated soil can do its work as a purifying and disinfecting agent.

10. If a self-emptying cesspool cannot be used, is the receptacle water-tight, suitably ventilated, and emptied at regular intervals?

11. Are its contents placed on the soil in the morning of a dry clear day, and in places where they may be readily absorbed by the earth, so that the odors may be as inoffensive as possible, and is copperas solution occasionally sprinkled over them?

12. If the house is in a village lot, which is too small to permit of any of the preceding arrangements, is a small water-tight receptacle provided and its contents regularly removed to a farm or the open country away from houses?

13. Is the kitchen sink furnished with a tight drain which will carry the drainage away from the house, instead of depositing it under the windows to decompose and act as an important factor in the production of disease?

14. Is the end of the drain next the house connected with the kitchen sink by a lead pipe with a trap?

15. Is the kitchen fire often made use of and considered an effective and economical way of disposing of articles which might otherwise be offensive?

## CHAPTER IV.

## VENTILATION.

**T**HE necessity of pure air in our homes cannot be too strongly urged; and its importance should secure for it the careful daily attention of every housekeeper. She will find it difficult, at best, to keep off illness from her family; but much may be done by a wholesome atmosphere toward keeping each member of the household strong, active, and happy. Sanitarians agree that pure air is the first essential for a healthful home.

The maintenance of pure air in our climate undoubtedly entails expense, for a great deal of fuel is needed to prepare outside air for our use; but, in estimating the actual cost, several points should be considered. Not only must the bills for coal and wood be compared with the bills for doctors and nurses, but account must be taken of the increase in headache, listlessness, laziness, irritability, and nervousness, which follow as a consequence of breathing impure air. These results, which incapacitate for the duties as well as the pleasures of life, are a less striking accompaniment of impure air than are diphtheria or typhoid fever, and their cause is, therefore, too frequently overlooked.

The housekeeper should personally attend to the daily airing of every part of the house, and to the warming of all living-rooms as quickly as possible afterwards. But she should remember that, if the outside air chance to be very damp or foul, no good end will be served by opening doors

and windows. She should make it her duty to guard against all draughts, and should look upon them as an indication of imperfect ventilation. She should remember that windows are made for the admission of light and for an occasional thorough change of air, but are not ventilators, and that all window-ventilators, and they are numberless, are make-shifts.

The ideal house is provided with an abundance of air by means of flues, without using the windows; but, in the ordinary house of the present time, the use of the windows has to be depended upon more or less for a quick change of air.

More air than would seem possible is admitted through the walls of the house and around the windows and doors. This amount is increased by the presence of an open fire, which draws the air toward it. A constant circulation is thus kept up, and the escape of air by the chimney keeps the atmosphere in a purer and more wholesome state than is possible with any other arrangement. An open chimney, even without a fire, carries off quite an amount of impure air. This may be greatly increased, when a fire is not needed, by placing a lighted lamp or candle in the fireplace to make a draught upwards.

It must be remembered that the cardinal principle of ventilation is circulation. It is even more important to provide a chance for foul air to escape than to furnish a special inlet for fresh air. Under the conditions of ordinary living, air which is made impure by breathing and the burning of lamps is generally warmer than outside air and has, therefore, a tendency to rise. If it can escape, its place will be filled by air drawn in from the cracks about windows and doors. The general outlet of air for the house should be in the top story, but sometimes the open window or skylight is im-

practicable on account of the down draught caused by the prevailing winds. Unless the position of the opening can be altered the plan has to be abandoned in windy weather.

The height of rooms should not be over ten or at most twelve feet, unless unusual means are provided for the escape of the vitiated air, which accumulates like an inverted lake, near the ceiling.

Special attention should be given to ventilating, as well as frequently airing, the kitchen and the bath-room. The odors of cooking are often so perceptible as to be a serious annoyance to the family, while they should be rarely noticed through the house and should never be troublesome. In the bath-room bad air is as dangerous as any other poison, and should be guarded against with equal vigilance.

To sum up, the important objects of ventilation are : —

I. To provide an abundance of pure air in every part of the house.

II. To avoid draughts, either warm or cold.

III. To provide means of escape for foul air and odors.

Time and money spent in attaining these ends will be well invested, and the householder will be richly repaid by the increase in vigor, comfort, and happiness of every member of his family.

#### QUESTIONS.

1. Are all living-rooms and sleeping-rooms thoroughly aired at least once a day?
2. Are the windows so placed as to make a draught possible when needed to effect a quick change of air?
3. After the rooms are aired early in the morning, are they, in cold weather, at once warmed again enough for

comfort and safety and to prevent remonstrances from the family against the daily airing?

4. Is there a constant supply of fresh air in every part of the house?

5. Is an outlet for foul air, as well as an inlet for fresh air, provided in the different rooms?

6. Are the inlets and outlets arranged to prevent constant draughts?

7. Is there a skylight at the top of the house, so placed with regard to the prevailing winds that it may be kept open a few inches most of the time as an outlet for impure air without causing a downward draught through the house?

8. If such a skylight is impracticable, can a window in the top story be kept open a little most of the time?

9. Are the outside or double windows made with two sashes, or with movable panes, so as to admit a current of air when desired?

10. Are all windows arranged so that they can be lowered easily from the top?

11. If there is a water-tank, is the air of the room in which it is placed kept fresh and pure, and is it frequently cleaned?

12. Are the halls supplied with plenty of pure, warm air?

13. Are sleeping-rooms kept cooler than living-rooms?

14. When a sleeping-room is used as a sewing-room or sitting-room, during the day, is it thoroughly aired before bed-time?

15. Do you open your chamber-windows as soon as you are dressed?

16. Do you at the same time always open the closet door?

17. At night is a piece of cotton cloth hung over the

opening of the window, a board inserted, or a screen placed before the bed to break the force of the current of air?

18. When there is a great difference between the temperature in-doors and out do you remember that a great deal of air finds its way in through the walls and around the windows, and the window should not be open as far as at other times?

19. In warm weather do you keep the bath-room window open as much as possible, both top and bottom, to allow the air to escape out of doors instead of into other parts of the house?

20. In cold weather is the bathroom window opened frequently, top and bottom, for a few minutes at a time?

21. Is there a thermometer in every room?

22. Are the living-rooms kept at a temperature not exceeding 70° F.?

23. Have you an efficient method for ventilating the top of the rooms, where foul air is apt to collect?

24. If not, can you put in a foul-air outlet, in the shape of a box, between the ceiling and the floor above, extending from the chimney to the chandelier, with apertures over the latter?

25. If a nursery, school-room, or sitting-room is occupied a large part of the day, or by many people at one time, are the windows occasionally opened for a few minutes, to change the air, at a time when the family are at their meals or occupied elsewhere?

26. Does the member of the family who is the last to retire thoroughly air the room where the family have been sitting through the evening, in order that the foul air may not have a chance to make its way through the house during the night?

Ventilation of the kitchen : —

27. Has the kitchen adequate arrangements for constant ventilation and occasional airing?

28. Do you keep a window lowered a little from the top?

29. Is there a ventilating-flue in the kitchen-chimney?

30. If odors from cooking are especially troublesome, can a hood over the range or stove be connected with the flue, or are kettles used which have special provision for carrying away the odors?

31. Are there windows on opposite sides of the kitchen for quickly changing the air?

32. Are there openings on different outside walls with register-ventilators which may be closed in very cold weather? Are these protected from dust by cheese-cloth?

*Note.* — These should be so placed that no draught will be felt in the part of the kitchen most in use, and should be as near the ceiling as possible, in order to move the upper strata of hot air, which usually carry odors over the whole house.

## CHAPTER V.

## HEATING.

IT must be the aim of the housekeeper to provide all parts of the house with air that is not only fresh and pure, but sufficiently warm for health and comfort. In this climate the question of heating the air is an important one during the greater part of the year.

Comfort is not secured by merely having hot air to breathe; the walls and floors also should be kept warm. The different rooms and halls of the house should be of so nearly the same temperature that no chill is felt on passing from one to another. Equable temperature is best obtained by gentle, continuous heat. To accomplish this in extremely cold weather it may be necessary to furnish heat all night.

When the house is heated by a furnace, or by steam or hot-water pipes passing through an air-chamber in the cellar, the hot-air conductors serve also as ventilating flues.

If the rooms are heated by stoves, or by radiators, some other means must be devised to bring in fresh air. It is sometimes introduced in the floor around the stove so that it is warmed before passing into the room.

The furnace is best adapted for houses of moderate size, and, if open fires are used in connection with it, there is also the best possible provision for the removal of impure air. The old-fashioned fireplaces, which our grandfathers used, were very large, and required an immense amount of fuel. When the fire was lighted it caused a tremendous draught,

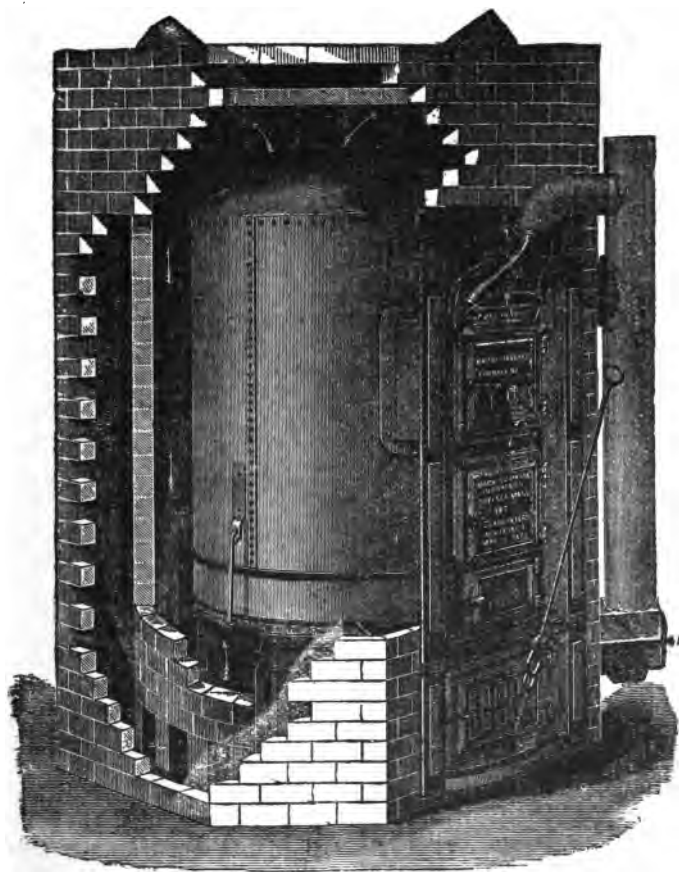
and air was drawn in through the cracks around the loose windows and from the cold halls. As a result the only warm place in the room was close to the fireplace, and this was often too hot for comfort. The modern fireplace and chimney are much smaller, and serve to remove the impure air without causing sensible draughts.

No part of the household machinery requires more intelligent or judicious management than the furnace, and it should never be left wholly to the care of servants. As its essential parts are usually completely hidden from view, the accompanying cuts are given to aid the housekeeper in understanding its construction.

A furnace is practically a large stove standing in an enclosed air-chamber. The enclosing surface may be galvanized iron, as in a portable furnace, or brick. The cold-air box is the passage which connects this chamber with the out-of-door air, and the hot-air pipes distribute the air after it has been heated. These should be so planned in reference to each other that the air from the cold-air box has to pass at least once around the furnace, before entering the hot-air pipes.

In order to meet the too-prevalent demand for compactness and cheapness, many furnaces are made on the principle of furnishing a small volume of air highly heated. The air as it enters the room is then in a state which is called "burnt." Sanitary requirements strictly forbid this. The cold-air box, the fire-pot, the hot-air chamber, the pipes and the registers should all be large enough to supply the rooms with a large volume of air moderately warmed, not over 120°F. Only then does the furnace meet the demands of both sanitary heating and ventilation.

The material of which the furnace is made is of less im-

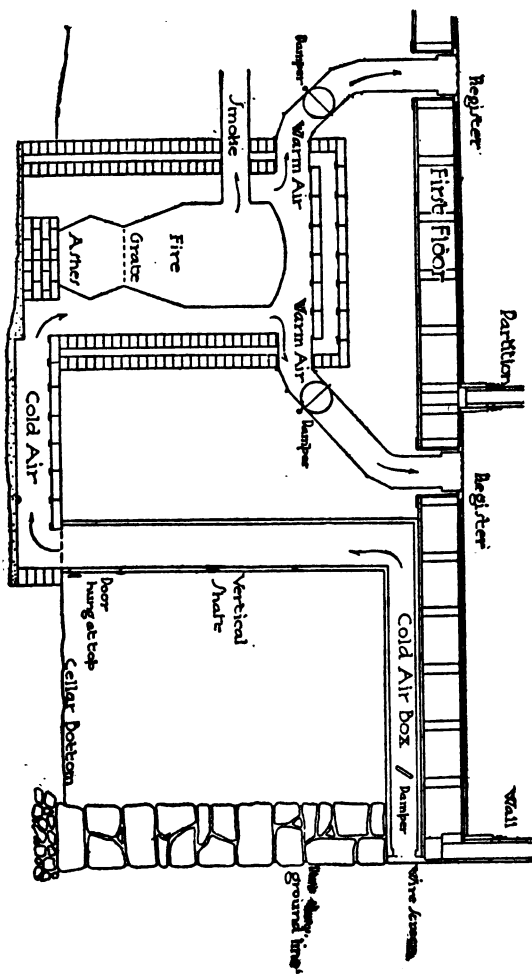


portance than the thoroughness of its construction. In cast-iron furnaces the few joints necessary should be horizontal. The old notion that cast-iron allowed carbonic oxide to pass through probably arose from the fact that cast-iron furnaces and stoves have many joints which it is difficult to keep tight; but stoves with loose covers and cracks have been used in kitchens for years with apparent safety. A moment's consideration of the conditions will show that there is little danger from this cause if the draughts of the furnace are properly arranged. If all the dampers of the kitchen stove are suddenly shut the gas comes into the room, but not otherwise. So, in a furnace, if the draught is up chimney, as it should be, there is little danger of contaminating the air.

As the tendency of warm air is always to rise, it will be found difficult to heat rooms on the first floor, if the pipes leading to them, which are necessarily nearly horizontal, are more than fifteen feet long.

Air at 70° is capable of containing much more moisture than it can at a lower temperature. A dish of water placed where it will slowly evaporate supplies this need, and prevents the air from seeming parched and dry.

Unless the amount of fire in the furnace can be regulated easily the family are apt to suffer when warm spring days come, and the fire is allowed to go out. There should be provision for open fires, or a low fire should be kept constantly in the furnace, until settled warm weather. The amount of heat can be most easily regulated when the house is heated by hot water, and, with this method, there is no danger of over-heating or burning the air.



## QUESTIONS.

I. — If furnace heat is used, —

1. Is the furnace large enough to heat the house thoroughly and at the same time furnish air for ventilation?

2. Are all the joints tight and the castings smooth and sound?

3. Are the furnace and pipes periodically examined and cleaned?

4. Is the smoke-pipe at least 16 inches from the ceiling?

5. Is the smoke-pipe so arranged that there is a good draught?

6. Is there provision for the evaporation of water?

7. Are the hot-air pipes so arranged that they do not come within two inches of any wood-work?

8. Is each horizontal pipe less than fifteen feet in length?

9. Have the hot-air pipes dampers in the cellar, by which the heat may be cut off from any part of the house when desired? Are these labelled?

10. Is the cold-air box short and direct, opening out-of-doors?

11. If necessarily long, is it easily cleaned, and so arranged that it cannot become a receptacle for rubbish?

12. Is it kept perfectly clean and dry?

13. Is the area of its opening equal at least to the area of all the registers less one sixth?

14. Is it so tight that the furnace cannot draw any air from the cellar?

*Note.* — Wooden air-boxes are not to be recommended, because they are liable to have cracks and imperfect joints. If such exist, some of the injurious effects may be removed by filling the cracks with cotton-wool. If an opening or door, such as is shown in the cut, is provided to be used in

cleaning out the air-box, it should be made to close tightly, so that air may never be drawn from the cellar into the furnace.

15. Has it a movable slide by which the amount of air admitted may be regulated?

16. Are there two cold-air boxes, on different sides of the house, to avoid the annoyance of too great wind-pressure?

*Note.* — This is especially desirable for a country house in an exposed situation.

17. Has the outside opening of the cold-air box a wire netting to keep out falling leaves, or cats, rats, etc.?

18. Is this opening away from every drain-ventilator, cesspool, yard-gully, ash-barrel, swill-tub, privy, or other source of contamination?

19. In a city house, is it on the side of the house farthest from the street, to avoid the entrance of dust, etc.?

20. If not, is cheese-cloth or bunting stretched over it to sift out the dust, and this cloth frequently cleansed?

21. Is it at least two feet above the ground?

22. Does the surface around it slope away sufficiently to carry off moisture rapidly?

23. Are the registers so placed as to collect as little dust as possible, *i.e.*, in the wall, when practicable?

24. Are they large enough for the room they try to heat?

*Note.* — Two sq. ft. for 10,000 cu. ft. of space.

25. If they are in the floor, are they taken out at least once a month, and thoroughly cleaned and the pipe wiped out with a damp cloth as far down as possible?

26. When the room is being swept, or the furnace shaken down, is the register closed?

27. Are the registers so placed with regard to the fire-place, ventilator, or window, that the pure, warm air, on entering the room, does not at once pass out by the outlet

for foul air, and thus cause a draught, and lessen the benefit from the furnace?

II. — If the house is heated either wholly or in part by open fires, —

1. Do you see that an abundant supply of fresh air is furnished to the fuel to avoid the formation of carbonic oxide by imperfect combustion, and also to prevent the air used to replace that which passes up chimney from being drawn from other parts of the house?

*Note.* — With coal, a *blue flame* indicates the presence of carbonic oxide, a most poisonous gas.

2. Are the draughts of the chimney strong enough to carry away all the products of combustion?

3. Is the hearth laid on a brick arch to prevent danger from fire?

III. — If stoves are used, —

1. Is there a provision for the introduction of fresh air to take the place of that drawn from the room by the stove?

2. When the fire is kindling, after putting on fresh fuel, are the draughts arranged so that no carbonic oxide or coal-gas passes into the room?

*Note.* — Neglect of this precaution often leads to serious or fatal consequences.

3. Do you keep an open dish of water on the stove to give the requisite moisture to the air?

IV. — If the house is heated either by steam or hot-water, —

1. Are the boilers inspected once every year, to see if they are in good condition?

2. Are the pipes tight so that they do not leak?

3. Are the pipes in the cellar covered with asbestos or some other non-conducting material?

4. If the rooms are heated by direct radiation, *i.e.*, if radiators for hot water or steam are placed in the rooms, are means provided for introducing plenty of fresh air, and supplying needed moisture to the air?

*Note.* — The need for moisture is imperative only when the air is heated excessively, as it is with steam and over-heated furnace.

## CHAPTER VI.

## LIGHTING.

UNDER the conditions of modern civilization much reading, writing, and sewing is necessarily done in the evening, and by artificial light. During the hours spent under artificial light we are in abnormal conditions,—conditions which at best are unsanitary and unnatural,—and all possible precautions should be taken to render them as harmless as possible. It is believed that much headache, often attributed to other causes, is in reality due to unsuitable lighting. Although the electric light and candles of tallow, wax, or paraffine are in use, yet the choice of illuminant is as yet practically limited to gas and kerosene.

The two chief points to be observed in connection with the artificial light are: *First*, To avoid undue vitiation and heating of air in the room; *Second*, To secure a strong and steady light.

All combustion uses up oxygen, and produces carbonic-acid gas; hence, with the exception of the electric light, all artificial illumination of a room is a great tax upon the air-supply and upon the means of ventilation.

It has been estimated that one ordinary gas-jet will consume as much air as two people, and a kerosene lamp will use as much as four people.

Unless the burner is of a good pattern, there may be an escape of unconsumed gas, which still further vitiates the air. All so-called whistling of the gas means an escape of unconsumed gas, and should not be allowed.

Combustion not only furnishes the desired light, but it also yields undesired heat, and this heat is the cause of much of the headache in the evening, as well as of much injury to the eyes. If it is necessary to hold the head near the light, it is best to have some kind of shade which is not a good conductor of heat.

The amount of vitiation of the air, and the amount of heat given off, are seen by the following table.<sup>1</sup>

	Quantity consumed.	Candle power.	Oxygen removed.	CO <sub>2</sub> produced.	Moisture produced.	Heat calories produced.	Vitiation equal to adults.
			Cu. ft.	Cu. ft.	Cu. ft.		
Tallow candles .....	2,200 grains.	16	10.7	7.3	8.2	1,400	12.0
Sperm candles.....	1,740 "	16	9.6	6.5	6.5	1,137	11.0
Paraffine oil lamp.....	992 "	16	6.2	4.5	3.5	1,030	7.5
Kerosene oil lamp ....	909 "	16	5.9	4.1	3.3	1,030	7.0
Coal gas, No. 5, batwing burner.....	5.5 cu. ft.	16	6.5	2.8	7.3	1,194	5.0
Coal gas, Argand burner .....	4.8 " "	16	5.8	2.6	6.4	1,240	4.3
Coal gas, regeneration (Siemens) burner...	3.2 " "	32	3.6	1.7	4.2	760	2.8
Coal gas (Welsbach incandescent) .....	3.5 " "	50	4.1	1.8	4.7	763	3.0
Electric incandescent light .....	0.3 lb. coal.	16	0.0	0.0	0.0	37	0.0

Since natural illumination is equal in nearly every part of the room, it seems desirable that artificial illumination shall also extend to every part of the room, to avoid an undue strain upon the eyes, when looking up from book or work.

<sup>1</sup> Notter and Firth: Treatise on Hygiene, p. 141.

In the use of the kerosene lamp several points ought to be noted : —

1. The lamp should be filled daily, for two reasons :  
(a) The higher the flame from the reservoir of oil, the less is the light given for equal volumes of oil burned. (b) The larger the air-space over the oil in the reservoir, the greater is the danger of an explosion.

2. Combustion is the more perfect, the nearer the maximum light is approached ; hence the burner should not be turned low, since the products of incomplete combustion vitiate the air.

3. Perfection of combustion also depends upon sufficient access of air to the wick where the burning occurs. This is attained in two ways : (a) By round wicks with air-space inside as well as outside — (the Argand and student lamps are of this type). (b) By the access of air to both sides of the flat wick — (the duplex burner, with double flat wick and extinguisher, is the type most used). A good burner allows the air to enter freely at the base, and hence the small apertures must not become clogged.

Welsbach burners favor complete combustion as well as greatly increase the light.

Since it is estimated that one third of the fires which occur are caused by kerosene lamps, it may not be out of place to mention some precautions as to their use.

Kerosene is obtained by distilling crude petroleum, which consists of a variety of inflammable and more or less volatile liquids. The more volatile give the most brilliant light (such as gasoline used in the gas-machines in country houses), and are of less commercial value, so that it is for the interest of the refiner to allow as much as possible of these more volatile products to remain with the kerosene.

The vapor of these volatile portions mixes readily with air, and mixtures thus formed explode violently when ignited.

Some of the cheaper kerosenes on the market will give off inflammable vapors when the oil is heated to  $90^{\circ}$  or  $100^{\circ}$  F. That is, if the reservoir of the lamp, with the burner and wick removed, were half filled with kerosene and placed in a dish of warm water, when the oil was warmed to  $90^{\circ}$  or  $100^{\circ}$  F. the space above the reservoir would be filled with a vapor which would explode if a lighted match were brought in contact with it, and if the lamp were broken and the oil spilled, it would burn freely, setting fire to whatever it reached.

Since it is not uncommon to have lamps near the stove, and since, especially with a lamp-shade, much heat is reflected downwards, it will be seen that a temperature of  $90^{\circ}$  to  $100^{\circ}$  F. is not unfrequently attained.

The only real safety is to use an oil which will not give off inflammable vapor at any temperature which will probably be reached. Oil which can be heated to  $140^{\circ}$  F. without yielding this vapor will not take fire even if the lamp is broken and the oil spilled; it will only burn at the wick, where it is heated much more.

The different state laws fix the temperature (called the "flashing point"), below which the oil must not give off these inflammable vapors, at different degrees from  $100^{\circ}$  to  $130^{\circ}$ .  $120^{\circ}$  would seem to be a good mean.

To blow the flame strongly is to run the risk of driving it down into the reservoir. A second opening in the lamp for filling is rarely tight, and vapors are apt to escape; the oil also "creeps" over the lamp, and thus vapors may be given off which vitiate the air, even if no explosion occurs. There is also a temptation to fill the lamp while lighted.

## QUESTIONS.

1. Is an abundance of pure air introduced into every room in which a lamp or a gas-jet is burning, to make up for the oxygen consumed by the flame?

2. Is sufficient precaution taken to provide means for the quick removal of the gases generated by the flame?

*Note.* — In case stationary gas-jets are used it is practicable to have the products of combustion carried out of the room by means of flues.

3. If kerosene is used, —

(a) Do you use oil of 120° F. flash test, as shown by standard instruments?

(b) Do you take care to select the best burner possible?

(c) Does the burner have some mechanical means of putting out the flame?

(d) If not, is care taken to turn the flame down and blow across the top of the chimney and never directly down into it?

(e) Are the burners boiled occasionally in water containing a little washing soda, to prevent creeping of the oil, as well as to clean them?

(f) Are you careful not to leave the lamps with the flame turned down?

(g) Do you change the wicks often? They strain out impurities and soon become clogged.

(h) Are "packed lamps," which have wicking saturated with oil and no liquid, provided for carrying about the house?

(i) Are the servants cautioned never to fill a kerosene-lamp near a fire or burning lamp?

4. If gas is used, —

(a) Are the gas-pipes and fixtures tight, so that no gas can escape into the room and vitiate the air?

*Note.* — The tarnishing of silver is a good indicator.

(b) Are the modern gas globes used, with large openings at the bottom, in order to secure a steady flame?

(c) If metal tips are used are they frequently renewed?

*Note.* — Lava tips last longer, but are liable to crack and clog.

(d) Is the gas-cock so arranged that it will turn no farther when the stream of gas is shut off?

*Note.* — Gas-cocks without a stop turn all the way round, and it is difficult to know when the gas is shut off. Probably more fatal accidents arise from this cause than from blowing out the gas.

(e) If a drop-light is used, with a rubber tube, are you careful to detach and air the tube frequently?

(f) Is especial care taken that a match is lighted and ready to apply before the gas is turned on, in order that none may escape to vitiate the air unnecessarily?

## CHAPTER VII.

## FURNISHING.

**I**T may be assuming too much to claim that the true standard of beauty in house-furnishings conforms strictly to that required for the best sanitary conditions, but, surely, it is not extreme to declare emphatically that the conventional standard is far from being one either of beauty or of health. Pure air and sunshine, two essentials of healthful living, cannot be obtained in full measure in the modern elaborately furnished house. And a common and growing mistake is this of using our houses chiefly as a means of displaying the objects which our tastes and our wealth permit us to procure, while we disregard the far more important claims of good health. "The first wealth is health," says Emerson. Our homes are preëminently for ourselves. Why should we turn them into show-rooms, that our neighbors may come and gape?

The canons of good taste everywhere demand simplicity and adaptability as their true basis. Furnishings which destroy comfort and injure health cannot, when judged by this rule, be recognized as truly beautiful.

That furnishings may destroy comfort cannot be denied by any woman who has found herself penned in an over-furnished room, where the mere act of turning around is attended by direful consequences in the shape of overturned Lares and Penates.

But how can furnishings injure health?

- (a) By preventing free access of light and air.
- (b) By laying unnecessary work on the shoulders of the busy housewife, so that the proper care of her home becomes a burden to her.

(c) By forming catch-alls for dust. Dust is composed of many widely different things: particles of carbon (soot), of granite, sand, or other mineral matter; pollen of flowers, bits of plant stems, bark, leaves; manure, small pieces of hair, dried skin, shreds of clothing, and microscopic forms of life such as bacteria and molds—these are some of the almost infinite possibilities of dust. The housekeeper's concern is centred on the microscopic forms of life in dust. Some of these germs can attack the human body, causing disease. Others work in kitchen and store-room and are responsible for the souring, fermentation, decay, and molding of foods. Moreover, dust, when decomposing under the influence of heat and moisture, is one source of the close, stuffy odor often noticed in ill-ventilated or heavily furnished rooms. Hence the only safe course is to discountenance dust in every case.

It is obviously impracticable to formulate hard and fast rules as regards furnishings. It must rest with the judgment of each housekeeper to determine how rigidly the law of simplicity shall be applied. Where many servants are at hand to do the extra work imposed by elaborate furnishings there is no reason for excluding objects of beauty, — carved woods, rare bric-a-brac, rich hangings, — which by their presence afford us daily pleasure. But when proper care cannot be given to such accessories, let them be sacrificed, unquestioningly, on the altars of comfort and cleanliness. Simply remember the *raison d'être* of furnishings and it will be impossible to go far astray. They are agents to minister

to our comfort or our pleasure. So soon as their proper care becomes a burden to the housekeeper, so soon as she allows her furnishings to crowd and elbow her in her own home, she has reversed the proper relationship: she has not conquered, but succumbed to her environment. Let each housewife be master of her furnishings — else will she be their slave!

In general, then, emphasis should be laid on simplicity both for the sake of comfort and for the sake of cleanliness. The following suggestions serve to show how these ends may be attained:

*Floors.* — Carpets entirely covering the floor cannot be kept thoroughly clean, and are, moreover, a constant temptation to the economical housewife to exclude the sun. Mattings and loosely woven carpets allow dust to sift through them to the floor beneath, whence it cannot be removed. Hard polished or painted floors, with rugs, are preferable to carpets or mattings. And the amount of care required by bare floors is little more than that demanded by carpets which, to be thoroughly cleaned, must be taken up at each annual or semi-annual house-cleaning.

*Walls, Ceilings, Woodwork.* — Each should be so finished as to be easily kept free from dust. To this end it is advisable to have the inside woodwork, walls, and ceilings smooth and of a nature to permit thorough cleaning.

*Windows.* — These are for the purpose of admitting light, and sometimes air. This purpose cannot be accomplished where, as is not uncommon, they are barricaded with two sets of blinds, two sets of shades, and lace curtains or heavy draperies. If their owners would take away half these barriers and leave the others raised and open, the good cheer and vigorous life which stream in with the sunshine

would speedily convert regret at the loss into rejoicing at the greater gain.

*Furniture and Hangings.* — The woodwork of furniture, even the concealed surfaces, should be smooth, and varnished or oiled, to prevent the lodging of dust and the absorption of gases. On this account, also, the use of upholstered furniture or of heavy woolen draperies of loose texture which cannot be easily freed from dust should be reduced to the lowest possible point.

#### QUESTIONS.

##### *I. General.*

1. Is the inside finish of the house as free as possible from horizontal projections, such as elaborate cornices and mantels, which may serve as lodging-places for dust?

2. Are the walls finished with paint or with smooth paper which can be easily freed from dust by the use of a wall-mop?

*Note.* — A good wall-mop may be made by fastening a soft cloth firmly around a broom, or by drawing over it a bag of Canton flannel.

3. Are the wall-papers, draperies, and carpets free from arsenic?

4. Since dust sifts through mattings and loosely woven carpets, are the floors laid with closely matched boards, even where they are to be covered?

5. In case rugs or carpets covering only a portion of the floor are not adopted, are the edges of the carpet frequently cleaned after sweeping, by the use of a damp sponge or cloth?

6. If there is a carpet under the dining-room table, is it occasionally sent to the naphtha laundry to be cleansed?

7. Are the inside shutters made without slats?
8. Are the Venetian blinds banished to the piazza?
9. Are the windows of all rooms so curtained as to permit free admission of the sunlight, and to offer scant hospitality to dust?
10. Are hangings and draperies so arranged as to be easily taken down and shaken?
11. Is the upholstered furniture made without tufting, so that it can be thoroughly cleaned by brushing?
12. Do the living-rooms contain neither furniture nor ornaments which cannot be properly cared for by daily dusting?
13. Are clothes-presses, cupboards, and store-rooms kept free from dust, mold, and accumulations of rubbish?

## *II. The Bed-rooms.*

1. Are useless ornaments and needle-work banished from the bed-rooms?
2. Have the windows such curtains only as can be washed?
3. Is the air allowed to circulate freely around the beds, unobstructed by curtains?
4. Are mattresses substituted for feather-beds?
5. Are mattresses and pillows aired daily, often turned and dusted, occasionally cleansed with naphtha, or otherwise, and frequently exposed in the open air on a sunny day for several consecutive hours?
6. Are the bed-coverings of material which can be washed?
7. Are they thoroughly aired every morning?
8. If mantel-beds or folding-beds must be used, are they so made as to allow, when folded, the circulation of air about the mattress?
9. Are soiled clothes removed at once from the sleeping-rooms?

### *III. The Bath-room.*

1. Has the bath-room a tiled, oiled, or painted floor, with no other carpet than a rug which is often aired out of doors?
2. Are its walls finished with tiles, paint, or varnished paper, to prevent the absorption of moisture and odors?
3. Are those receptacles for dust and rubbish, the drawers and cupboard usually connected with the set-bowl, exchanged for a wall-cupboard?
4. In summer, does the fly-screen cover the whole window, so that the upper sash can be lowered as well as the lower one raised?

### *IV. The Kitchen.*

1. Is the kitchen floor either oiled, painted, or covered with oilcloth, or other impervious covering?

*Note.* — Oilcloth carpets must be fitted closely to the wall, in order that dust may not collect under the edges. Great care should be exercised in washing them, lest water run under the edges.

2. Are the walls made proof against moisture and odors by tiles, paint, or varnished paper?
3. Is the kitchen free from that nuisance, a closet under the sink?

*Note.* — This closet too often serves an untidy servant as a place of concealment for unwashed pots and pans, soiled rags, etc., and is an attractive spot for water-bugs.

4. Is a large, light, and airy pantry substituted for the several small, dark cupboards which usually join the kitchen?

5. Is the sink of porcelain, soapstone, or iron?

6. Is the pipe which conveys the drippings from the refrigerator entirely disconnected from the drainage system of the house?

*Note.* — All shelves, boxes, and jars, especially refrigerators, in which food is kept, should be kept with the most scrupulous care, and usually only the “eternal vigilance” of the mistress herself will accomplish this.



## CHAPTER VIII.

## THE COUNTRY HOUSE.

In deciding upon a country home, the first consideration is the character of the soil and the underlying rock formation, since the artificial drains and careful grading of the city engineer are wanting.

If the soil is clayey, or has an impervious clayey layer a short distance below the surface, then at certain seasons of the year water is liable to stand for some time in pools and even to penetrate to the cellar. This class of soils also allows surface drainage to run for long distances along its impervious surface and so to reach wells at some distance from the source of the water.

A slaty rock with joints, or a broken conglomerate with many cracks, also allows water to percolate for long distances, while a deep, sandy soil presents the most favorable conditions for two reasons in particular: First. The porous nature of such soil allows of quick drainage of rain-water, so that the cellar and surrounding soil may be always fairly dry, with no stagnant water. Second. Such soil allows of the ready purification of all polluting material which is buried in it or flows through it, so that the out-flowing water is freed from its former harmful ingredients. This is accomplished, as we now understand, by an abundance of plant-life of a peculiar character in the upper layers of the soil. This plant-life is most abundant in the first two feet and in sandy loam.

When these plants, known as nitrifying organisms, have plenty of air, they convert into harmless nitrates all the putrefying nitrogenous matter brought to them; but they cannot do their beneficent work if they are smothered in water, or otherwise deprived of air. In that case other less desirable plants thrive and work, and noxious products may result. Hence, it is necessary, for quick and complete purification, that a drenching of the soil with water which carries anything organic and liable to decompose (and what water does not which washes the surface of the ground?) should be followed by a period in which air, and not water, may penetrate to a considerable depth, thus furnishing the needed oxygen for the nitrifying plant to grow and to free the water from its harmful organic matter.

For this reason, the sink spout, so often seen in country farmhouses, delivering dirty water at all hours of the day on one spot, resulting in a wet, soggy soil, should be moved at its outlet each day, so that a new area of soil may receive the water while the old one is doing its work of purification. In from three to five days, according to the depth of the sand or loam, the same spot is ready for another flooding.

Because of this same characteristic of the beneficent plant-life, the leaching cesspool is wrong in principle, since it delivers its foul liquid below the level at which the most vigorous plant growth occurs, and thus allows this unpurified water to mingle with the underground water, which is commonly held to be good because of its freedom from surface contamination. The leaching cesspool, carrying filth below the surface, is a backward step from savage life, which threw its refuse on the surface. The purifying power of the upper layers of the soil is enormous, and should be utilized by all country dwellers to the profit of the agri-

cultural crop which feeds on the nitrates that are the product of this other invisible plant-life.

The earth-closet takes advantage of this property, and every country house should possess this means of sanitation. Plenty of absorbent loam can be brought from the fields in dry weather, and when further dried in barn or shed can be used to absorb the moisture from the closets and chamber slops and then removed to the fields and replaced by fresh earth. If iron tanks on trucks are used this may be readily done as often as necessary. In a large country house this method necessitates a separate drainage system for the bathtubs, laundry-tubs, and sinks. When some spot of land, sloping away from the house and at a distance of 500 feet or more, can be found to which a large amount of water may be carried by pipes and automatically distributed to the advantage of trees and crops it is possible to dispose safely of all house drainage. This is the simplest way of caring for it, and is called, technically, surface, or broad irrigation. This is perfectly safe and successful only when the principles referred to are scrupulously followed: namely (1), the quick disappearance of the water from the surface and no overdosing of any one spot; (2) the utilization of the prepared food by growing trees or crops. The accumulations of the winter under the ice are quickly disposed of by the vigorous growth of spring.

Because of the porosity of the ground and the rather free circulation of water below the surface, wells are peculiarly liable to be contaminated when ignorantly placed in close juxtaposition to the house and its waste drains. Too great care cannot be taken of the surroundings, even for a considerable distance.

Having secured a house on this well-drained area,

with free circulation of air and sufficient sunlight, unhindered by close-growing trees, it only remains to carry out the suggestions in the previous chapters, and to see to the conditions surrounding the barn, the dairy, the vegetable-house, etc. If, as is often the case, the waste-water from the well falls upon the ground at its mouth, it should be carried away by a cement or other impervious drain. The mouth of the well should be protected from any surface leakage; it is advisable to place a layer of cement on the outside of the stone or brick curb, which should rise a foot or two above the surface and extend two or three feet below. This cement will also serve to keep out the angle-worms and other small creatures which are liable to fall into the well. The well should never be used for cold storage. The practice of hanging dressed meat, poultry, and milk-cans in the well should never be tolerated. There is too much risk in such methods, for wholesome drinking-water is becoming one of the most precious possessions of mankind.

To lack of cleanliness is due most of the trouble from milk as a agent of the spread of disease.

In places where it is not the custom to have cellars, it is only necessary to emphasize the importance of a free circulation of air under the house. It is possible to live even over water, provided this air-space is sufficient to keep the floor from becoming sodden and moldy.

This lack of air-space is the bane of country buildings in the northern United States. For the sake of protection from freezing in winter, the house, or portions of it, rest on the ground, or are banked up so that no circulation of air is possible. In other portions of the country, where this necessity for warmth does not exist, the danger frequently comes from this space being used as a refuse heap.

Clean soil is the primary factor in the possibility of clean air and clean water. It is only ignorance of sanitary principles which causes the deplorable conditions so often found in the country, conditions which a little knowledge could remedy to the great advantage of the health of the family.

If the water-supply is brought from a mountain spring it should, if soft, be conveyed in wooden or tin pipes, since such water is liable to dissolve lead or brass pipe in such measure as to be dangerous.

#### HOUSE INSPECTION.

If a house ready built is to be rented or purchased, it is not sufficient that the style of architecture and the social aspect of the locality be considered. The seeker for a house which is also to be a beautiful home must carefully consider the far more important points of character of soil, age of house, honesty of construction, style of plumbing and of heating apparatus, and the possibilities of sunlight and air.

Until there is opened in every city and town an office from which trained inspectors can be obtained, — men or women who understand what *living* in a house means, and what dangers come in the *using* of apparatus which while new and untried seems to be correct in principle, — until then the house-hunter must herself understand the cardinal points of safety.

Under all circumstances dampness, darkness, and dust-catchers are to be avoided, and as much sunlight, as dry a soil, as free circulation of air as possible, and as much opportunity for a generous use of soap and water without injury to anything, are to be desired.

Therefore look to the condition of street, yard, rain-

gutters, cellar-walls, cellar-floor, and dark closets, if any. Note if there is any appearance of mold — the odor will usually betray it; of leaks in walls or roof. Note the sun plan; that is, the hours in the day during which the sun can shine into each room both winter and summer, remembering that sunlight is nature's disinfectant as well as life-giver.

Note relation of windows to the prevailing direction of the wind.

Note character of interior construction and finish with reference to holding dust.

Examine the drainage plan from attic to cellar. Never move into a house the drainage pipes of which are so built in that they cannot be readily seen. Note the traps, the slope of the main pipes, etc.

Secure a written statement from the city inspector; if possible, be present when the inspection is made.

Every housewife should know the "sewer odor;" it is as characteristic as that of onions.

Examine the heating apparatus; note if the cold-air box, etc., answers to the requirements given in Chapter V.

Note the possibilities of obtaining a quick change of air in every room.

Carefully inspect the apparatus for water-supply — the tank in the attic, if there is one (each water-closet must have its own separate flush-tank); avoid the use of a well in any thickly settled region. Learn from competent authority if the town supply is well cared for. Beware of house filters; water, that prime necessity of human life, should be like Cæsar's wife — above suspicion.

## CHAPTER IX.

## SANITARY PRECAUTIONS.

The first axiom of modern sanitation is that prevention is better than cure. Disease may be prevented by sanitary cleanliness. This means, first, the free use of the two great natural disinfectants, pure, sun-dried *air*, and *fire*; second, the quick removal of dirt. Sanitary law is often flagrantly violated by throwing the dust gathered in sweeping a house, and especially a schoolhouse, into the street or on the ash-pile in the yard, whence the four winds of heaven distribute it through the neighborhood. Possible agents of disease are removed if all dust is burned and all clothing and rooms are kept constantly disinfected by air and sunlight.

The second axiom is that if disease has appeared it must be confined to the person or spot where it first showed itself. This requires *isolation* of the person and place until both have been thoroughly disinfected. Nothing in all sanitary science is so well established as the possibility of stamping out disease in this manner, and in nothing is the average public so careless, because so ignorant or so indolent.

Suspicious cases of even trivial diseases, like certain forms of eczema and sore eyes, should be promptly isolated. The use of separate towels, and special care in keeping the hands clean, would save untold suffering and annoyance. Proper precautions should be taken with such diseases as well as with the more dangerous cases like scarlet fever.

The present prevalence of consumption is due largely to a lack of sanitary precautions in the past. The soil, houses, and clothing have all been infected to a great extent, and not only will years of education be needed to teach the proper management of the disease, but also generations of effort will have to be put forth to eradicate the disease.

Children should be taught sanitary cleanliness from the earliest years, and the whole community should be roused to the needlessness of much of the sickness which prevails, and of the deaths caused by carelessness and ignorance.

Chemical disinfection means the quick killing of all germs. Corrosive sublimate (mercuric chloride), long known to the housewife as bed-bug poison, is a very efficient germ-destroyer. Unfortunately it is also fatal to human life if taken internally, and hence must be used with caution. One part of the solid in 500 parts of water makes a solution in which no germ can survive.

Infected clothing may be soaked in this solution before washing, and woodwork may be wiped with it. Even the skin, if not broken, may safely be bathed with it. As it is odorless and efficient, the housewife should make herself conversant with its safe use.

"Chloride of lime" and "chlorinated soda" are, in strong solution, efficient disinfectants, but both injure metals and fabrics.

Of the other disinfectants in the market some have their appropriate use in certain cases. For instance, after a room has become infected it must be fumigated by some gas which will penetrate every part. The fumes of burning sulphur are often used, but it is necessary to have the air damp and the fumes in great amount.

Formalin, or formaldehyde, is now much used for this

purpose, but similar precautions as to quantity and efficiency are needed.

Permanganate of potash, and copperas, or iron sulphate, have a power of destroying organic matter which may be utilized in many ways.

Steam and hot soapsuds are also efficient in many cases. In the list of books for further study many references will be found; while the latest investigations are reported in the various health journals.

## QUESTIONS.

1. Do you quietly supervise the weekly dietary, so that a due proportion of the essential food-elements are set before the family in a palatable form?
2. Is the proportion of the nitrogenous part to the starch, sugar, and fats, about one to four?
3. When planning the food do you bear in mind the changes necessitated by the great variations of climate, and do you adapt the dietary to the season?
4. Do you, for instance, provide fruit and vegetables, instead of puddings and rich entrées during the early spring; fish sometimes, instead of meat, during the early summer days?
5. In the early fall do you keep close watch over the fruit and vegetables to see that they are ripe and yet fresh?
6. In the late fall do you give the most generous diet of the year?
7. Do you provide the children with pure milk, and with food containing mineral salts?
8. Do you see that the old people are provided with easily digested food, so as not to invite disease by overtaxing the digestive organs?
9. Are you careful in respect to the use of tea and coffee by young people?
10. Do you know definitely the source and surroundings of the water-supply?
11. Do you take especial care to have the water which has been standing in the pipe over night drawn off before the breakfast-kettle is filled?
12. Do you make sure that the tea-kettle is emptied and rinsed the first thing each morning?

13. Do you positively forbid the use of water from the hot-water tank for cooking?

14. Do you avoid the use of all soldered vessels for heating water?

15. Are all tanks or other vessels containing water to be used for drinking or cooking so placed as not to be exposed to foul air?

16. If you use water from a well, has it been subjected to a chemical examination?

17. If not, have you evaporated a pint or a quart on the stove in a white porcelain or china dish free from crackles and failed to detect any odor while it was evaporating or any considerable blackening of the residue when quite dry and slightly heated?

*Note.* — Sewage contamination causes a bad odor in such a case, and surface-water draining into a well will cause a dark residue which “chars” on heating.

18. Do you look carefully after the surface of the ground near the well, and see that no drain opens near ; that no slops are thrown out in the vicinity ; and that the cover fits tightly, so that crickets and the like cannot make their way in?

19. Is the well so situated that the bottom is above the cesspool, barn-yard or outlet of the sink drain, and so far from them as to avoid suspicion of soaking?

20. Is the well examined each spring and fall, to see if anything has fallen or crawled into it?

21. If the water is stored in a cistern, are the roofs and gutters carefully cleaned from dead leaves?

22. If the water is brought from a distant spring, is it carried in iron or wooden pipes, not in lead or galvanized iron? or, if in lead, do you know that it is not acted upon by the water?

23. Is the water nearly odorless when boiling?

24. Is the cistern kept carefully cleaned and well aired, and is it accessible?

25. If the water is from a town supply, have you tested it by tying a square of clean linen over the faucet, and examining, after two days' use, to see if there is need of a filter?

*Note.* — This simple filter is very good ; a sand or charcoal filter may be used. It should not be a complicated one, however, and should be carefully looked after, and frequently cleaned. In case of an epidemic in the neighborhood all water should be boiled before it is used for drinking or cooking.

## CHAPTER X.

## SANITARY WORK FOR WOMEN.

A paper read before the Association of Collegiate Alumnæ, May 28, 1887,  
by ANNIE E. ALLEN.

EVERY woman should have a knowledge of sanitation at her command. Its value rests not only on its general importance, but on its wide applicability. It is essential in the most varied social relations. Whether a woman is selecting a dwelling-place for herself, making a home for others, or providing the surroundings of young children, the knowledge and observance of sanitary laws is a requisite for the satisfactory fulfilment of her duties. In all more public forms of responsibility which women are called upon to assume, such as, work upon school committees, positions either upon boards, or as officials of penal and charitable institutions, and in all philanthropic work, a scientific and thorough understanding of sanitation, as well as of hygiene, is the only solid foundation of successful effort.

*Housekeepers.* It is, first of all, to women as housekeepers that sanitary science is valuable. Our social order gives to most women, during a greater portion of their lives, the responsibility of creating and preserving the conditions of home life. Upon these conditions depends, in large measure, the health of the household, especially that of young children. Personal hygiene is also an essential part of any successful effort to secure and maintain health. But

no amount of hygienic precaution in regard to clothing, bathing, eating, exercising, and sleeping will avail, if air is provided which is laden with organic impurities and germs of disease, and which has had its life-giving properties exhausted by repeated inhalations.

*The Plumber.* When the housekeeper has a plan of every inch of pipe in her house, and the plumbing is simple, accessible, made of sound material, kept clean and well ventilated and periodically inspected, there will be little occasion for the plumber. But a knowledge of sanitary laws enables the housekeeper to send for him in season, to have an intelligent oversight of his work, and to make timely suggestions. It also enables her to understand the importance of good work and good material, and the false economy of accepting poor substitutes for these essentials. It brings home to her the danger of postponing the expense or trouble of calling in the plumber when the life and strength of the household are at stake.

*Servants.* The housekeeper has a serious responsibility in the training of servants. Many of them will have homes of their own, and become centres of wide-reaching influence under conditions which make habits of cleanliness and watchfulness of the greatest importance.

*Summer Resorts.*—It is not enough for the householder in the city or country house to know that at home the water-supply is pure; the air uncontaminated by damp or foul ground-air rising through the cellar and house; the waste products carried away quickly and completely, and their foul emanations not allowed to escape back through the fixtures. She should be even more cautious at seaside or country resorts, where the provisions made for the few brief summer months are notoriously defective,

and where the presumption is against anything but imperfect arrangements. Yet people, who are comparatively enlightened in these matters and careful at home, often go to such places, and even take young children, without examining the water-supply or drainage. They content themselves with the assurance of the landlady, or at most the general reputation of the place for healthfulness, without personal inspection.

*Boarding-houses.* The city boarding-house is another possible source of ill-health. More or less elaborate plumbing is demanded by the relatively large household, and the expense of plumbing increases in geometrical ratio to the number of fixtures. But the money-making object of the building can be met only by great apparent convenience to attract boarders, and cheap work to save cost.

*Duty to Self.* It should not be forgotten that, while the head of a family has peculiar and complicated responsibilities, the individual, in selecting her own boarding-place, has a no less serious duty to herself and to her work in the world, in guarding her health by a wise choice of sanitary surroundings, and by such precautions as are possible.

*Boarding-schools.* The same probability of danger noted in the boarding-house attends the boarding-school. Similar conditions often exist of a building originally designed for a private family, and afterwards adapted to large numbers. This is likely to result in defective plumbing; small, stuffy recitation-rooms; dark closets for outer clothing; damp, narrow, close halls, from which much of the house is furnished with such air as it gets. The head of a private boarding-school has some serious and difficult problems to

solve in sanitary science, and great credit is due to many who have successfully found the solution.

*Public Schools.* The teachers in our public schools almost universally suffer from inadequate ventilation. In the school-rooms are children to whose clothing and persons little care is given, and the drainage system is often poorly arranged and improperly cared for. The teacher is comparatively helpless. Her influence can be only indirect and personal; by example, by a word here and there, and by cautious and tactful suggestion and assistance. To interest and aid the janitor, to arouse public sentiment among fellow-teachers, to influence the children, is a work that lies within the reach of the woman who thoroughly understands sanitary principles.

*Mothers and Schools.* The problem of reaching parents, and of rousing the general public to interest on the subject of school sanitation, has not yet been solved. But it will be difficult to obtain better conditions until mothers realize the vital importance of healthful conditions in the school-room as well as at home, and understand in what these conditions consist.

*School Committee.* The quiet, vigilant, effective work of personal inspection and suggestion which is accomplished by women on the school committee seems to indicate that, when the work of competent women as public officials is more widely extended, good practical results may follow. On local boards of health, and as trustees of charitable and penal institutions, there is much work that is especially fitted for women, and that calls for intelligent, practical knowledge of sanitary facts and principles.

*Philanthropic Work.* The whole field of philanthropic effort demands such knowledge as a prerequisite for work

that strikes at the very roots of moral and social difficulties. The causes of the centres of the moral and physical disease and impurity that exist in the midst of us are extremely complex, and interwoven with the very fabric of our civilization. Any deep-reaching change must be difficult and slow, — a historic and social growth. The great problem of the distribution of wealth will not be solved by any one country or generation; but the distribution of intelligence among the poor, which enables them to use the means they have to the best advantage, is the especial opportunity of women, and one step toward the solution of the greater problem.

Sanitary legislation is essential, and is making progress; but no great reform is the work of a day. In sanitary matters, more than any other, personal, individual service must go hand-in-hand with legislation in order to make legislation effective. The habits of people must be improved as well as their houses. Temperance organizations have done a great work, but they will not effect a truly national and radical reform until they strike at the root of the evil. Bad food, unwholesome surroundings, unclean habits, and foul air, are the best friends of alcohol.

It is no longer necessary to defend and prove as an abstract theory the importance of health, the close relation between bodily vigor and mental activity and soundness, the impossibility, without health, of the best work, or the keenest pleasure, or the most completely poised and sustained character.

Theoretically, we respect the physical foundations. But, practically, we say, "We will build first our structure of domestic duties and social pleasures, of intellectual achievement, of philanthropic and church work, and then, if we find the physical underpinning a little shaky, we will prop it up

with a tonic or a vacation." But the physical life is no more to be established on this confused and chaotic system than the intellectual or the moral life. Health can be secured only by effort as continuous, as carefully adapted, and as systematic as the processes of physical life themselves.

If, for instance, we could save all our breathing for the year, and condense it into the brief period after the spring cleaning, spasmodic effort would do very well. But, until the human body can content itself with an annual breathing-spell, the daily, hourly, momentarily need of pure, fresh air should be respected.

The day is past when sickness was held to be a direct interference of Providence, as retributive punishment. Pestilence, fevers, and weakness are, indeed, penalties for sin, but it is for the sin of ignorance. In this age of scientific enlightenment and invention and wide-spread information, ignorance of the primary conditions of health and vigor is unpardonable. A knowledge of sanitary principles should be regarded as an essential part of every woman's education, and obedience to sanitary laws should be ranked, as it was in the Mosaic Code, as a religious duty.

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# INDEX.

---

	PAGE
Air, burnt . . . . .	38
Air-chamber . . . . .	37, 38
Air, circulation of . . . . .	32
Air, ground . . . . .	10, 11, 12, 72
Air, heating of . . . . .	37
Air, importance of pure . . . . .	31, 50, 56
Air, moisture in . . . . .	40
Air, movements of . . . . .	12
Air, temperature of . . . . .	35, 38
Air, vitiation of, by lights . . . . .	47
Artificial light . . . . .	46
Ash-closet . . . . .	28
Bath-room . . . . .	35, 57
Bed-room . . . . .	34, 56
Boarding-house . . . . .	73
Boarding-school . . . . .	73
Boards of Health . . . . .	7, 9
Burners, choice of . . . . .	50
Carpets . . . . .	54, 55
Ceilings . . . . .	54
Ceiling, ventilation of . . . . .	33, 35
Cellar . . . . .	11, 13, 14
Cellar, dangers of a visit to . . . . .	11
Cesspool . . . . .	29, 60, 69
Cistern . . . . .	69, 70
Cleanliness, sanitary . . . . .	65, 16
Closets, to be avoided . . . . .	57

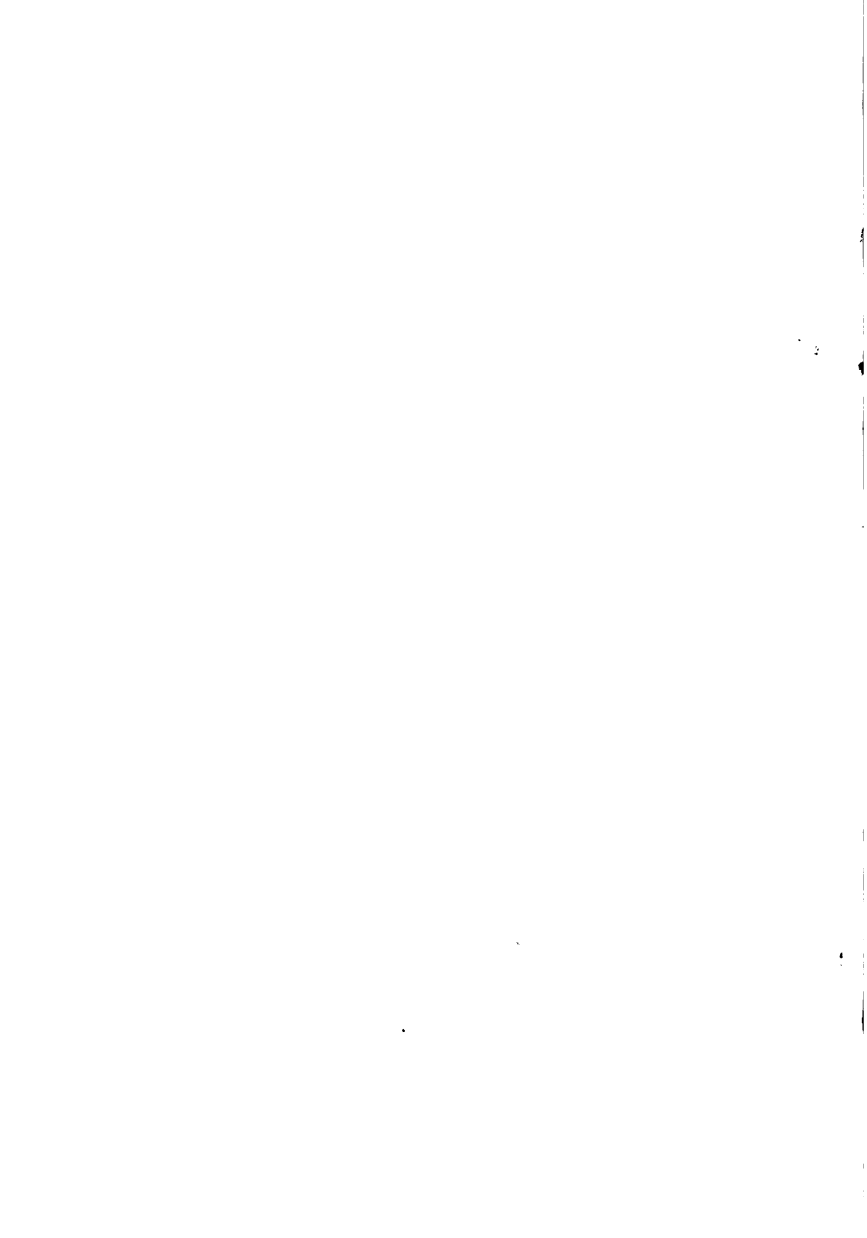
	PAGE
Closets, ventilation of . . . . .	34
Country house . . . . .	59
Cold-air box . . . . .	34, 42, 43
Consumption . . . . .	10, 66
Dampness of soil and cellar . . . . .	10, 11
Dietary . . . . .	68
Diphtheria . . . . .	8
Disease . . . . .	8, 10, 65
Disinfection . . . . .	28, 66
Disinfectants . . . . .	66, 67
Disposal of household wastes . . . . .	29, 30, 59, 60, 61
Drains . . . . .	13, 20, 22, 30, 69
Drainage . . . . .	8, 15, 59, 64
Drainage, examination of . . . . .	16, 19, 20, 63, 69
Drainage, plan of . . . . .	19
Drainage, sanitary, ten rules of . . . . .	17
Drainage, three canons of house . . . . .	16
Drainage system . . . . .	61
Drainage system, illustration of . . . . .	18
Drinking-water, contamination of . . . . .	63, 68, 69, 70, 72
Dust and dusting . . . . .	12, 43, 53, 55, 56, 57, 63
Earth-closet . . . . .	28, 61
Essentials . . . . .	10, 16, 33, 37, 52, 59, 63
Evaporation of water in traps . . . . .	23
Field, Rogers, quoted . . . . .	15
Filter . . . . .	64, 70
Fireplace for ventilation . . . . .	32
Fixtures, inspection of plumbing . . . . .	16, 19, 23, 64, 72
Flush-tank . . . . .	29, 64
Fresh-air inlet . . . . .	32
Food . . . . .	68
Furnace . . . . .	37, 38, 42, 43, 45
Furnace, care of . . . . .	38
Furnace, illustrations of . . . . .	39, 41
Furnishing, sanitary . . . . .	52-58
Furniture . . . . .	55, 56

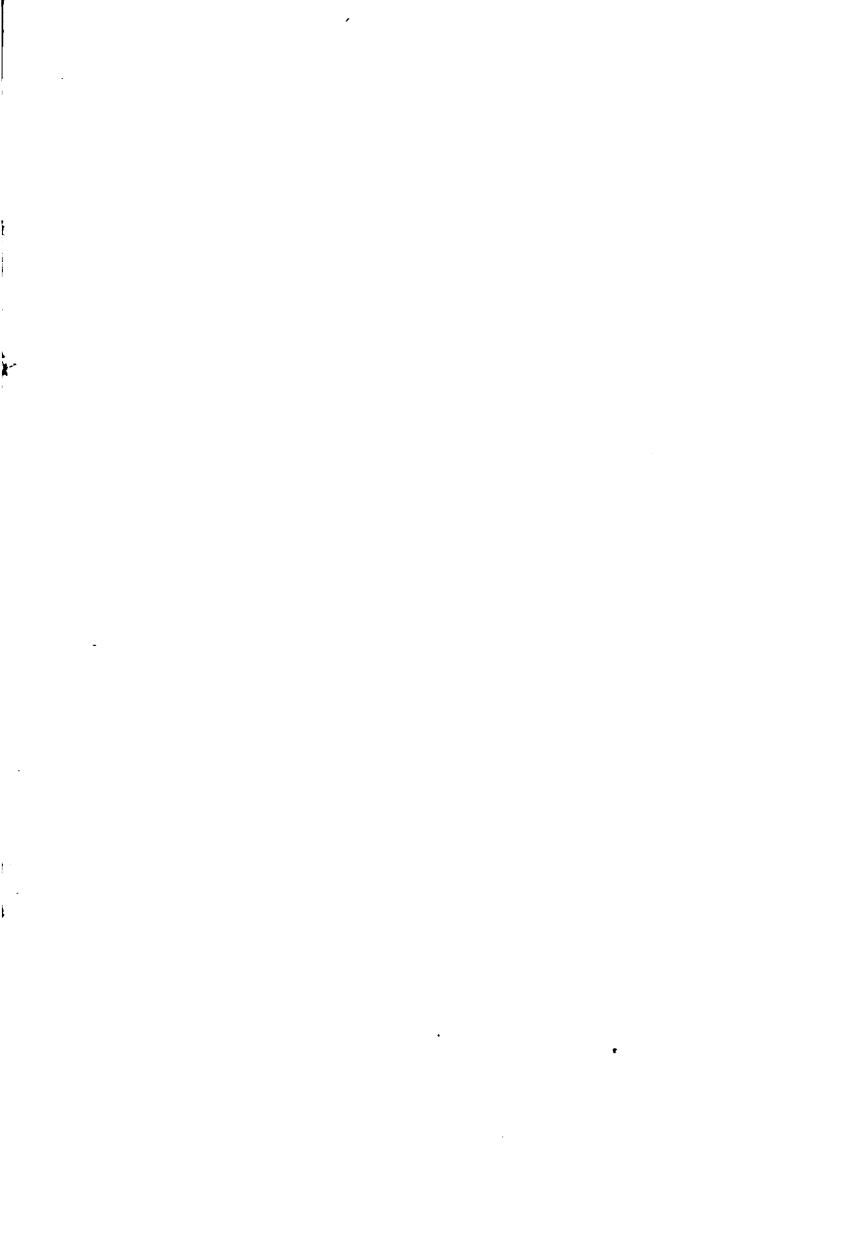
	PAGE
Gas-fixtures . . . . .	46, 50, 51
Gerhard, W. P., quoted . . . . .	10, 19
Germ theory of disease . . . . .	53, 65
Grease-trap . . . . .	26
Health, two essentials of . . . . .	52
Heating, essentials of . . . . .	37, 38
Home, hygiene of . . . . .	7, 71
Home, essentials of a happy . . . . .	9
Hot-air pipes . . . . .	38
House-drain . . . . .	19
House-drainage, three canons of . . . . .	16
House-drainage, illustration . . . . .	18
House inspection . . . . .	9, 63, 64
Housekeeper . . . . .	7, 8, 15, 37, 53, 71, 72
Housekeeper, motto of . . . . .	9
House, situation of . . . . .	10, 14, 59, 61
House, surroundings . . . . .	10, 63
House, unsanitary . . . . .	8
Inspectors . . . . .	9, 63
Irrigation, sub-surface . . . . .	29
Irrigation, surface . . . . .	61
Isolation, person and place . . . . .	65
Kerosene . . . . .	48, 49, 50
Kerosene lamp . . . . .	46, 47, 48, 50
Kerosene lamp, explosion of . . . . .	49
Kitchen, furnishing of . . . . .	57
Kitchen sink . . . . .	30
Kitchen ventilation . . . . .	36
Lamp, kerosene . . . . .	48, 50
Light, vitiation of air by artificial . . . . .	47
Light, dangers of artificial . . . . .	46
Mechanical trap . . . . .	24
Milk . . . . .	62, 68
Open fires . . . . .	44

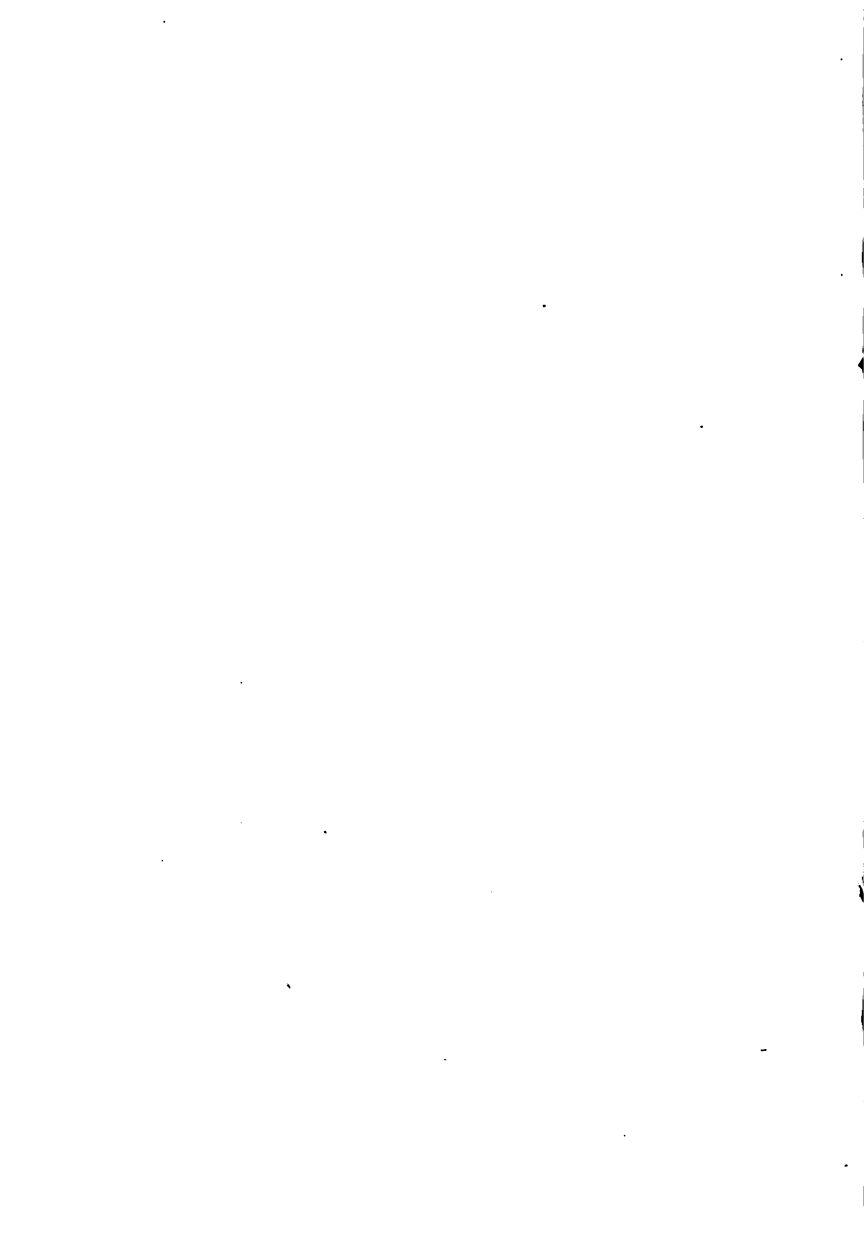
	PAGE
Over-flow pipe . . . . .	23, 27
Pail system . . . . .	28
Pan-closet . . . . .	25
Pan-closet, objections to . . . . .	26
Peppermint test . . . . .	19
Philanthropic work . . . . .	74, 75
Pipes . . . . .	19-25, 30, 63, 64, 68
Plant-life . . . . .	59, 60
Plumbing . . . . .	15-27, 72
Plumbing, plan of . . . . .	19, 66, 72
Pot-trap . . . . .	24
Public schools . . . . .	74
Putnam, J. P., quoted . . . . .	17
Radiators . . . . .	37, 45
Rain leaders . . . . .	27
Refrigerators . . . . .	27, 58
Registers . . . . .	42, 43
Rheumatism . . . . .	10
Safe wastes . . . . .	27
Sanitary conditions maintained . . . . .	8
Sanitary drainage, rules of . . . . .	17
Sanitary furnishing . . . . .	52, 58
Sanitary title . . . . .	9
Sanitation, importance of knowledge of . . . . .	7, 71, 76
Sanitation, axiom of . . . . .	65
Sanitation, certificate of . . . . .	9
School Committee . . . . .	74
Sewerage and sewage disposal . . . . .	17, 29, 30, 59, 60, 68, 69
"Sewer odor" . . . . .	64
Silver, tarnishing of . . . . .	14, 51
Sink spout . . . . .	60
Situation of house . . . . .	10, 14, 59, 61
Siphonage . . . . .	24
Soil-pipe . . . . .	19, 22
Soil, character of . . . . .	13, 14, 59, 62, 63
Stoves . . . . .	44

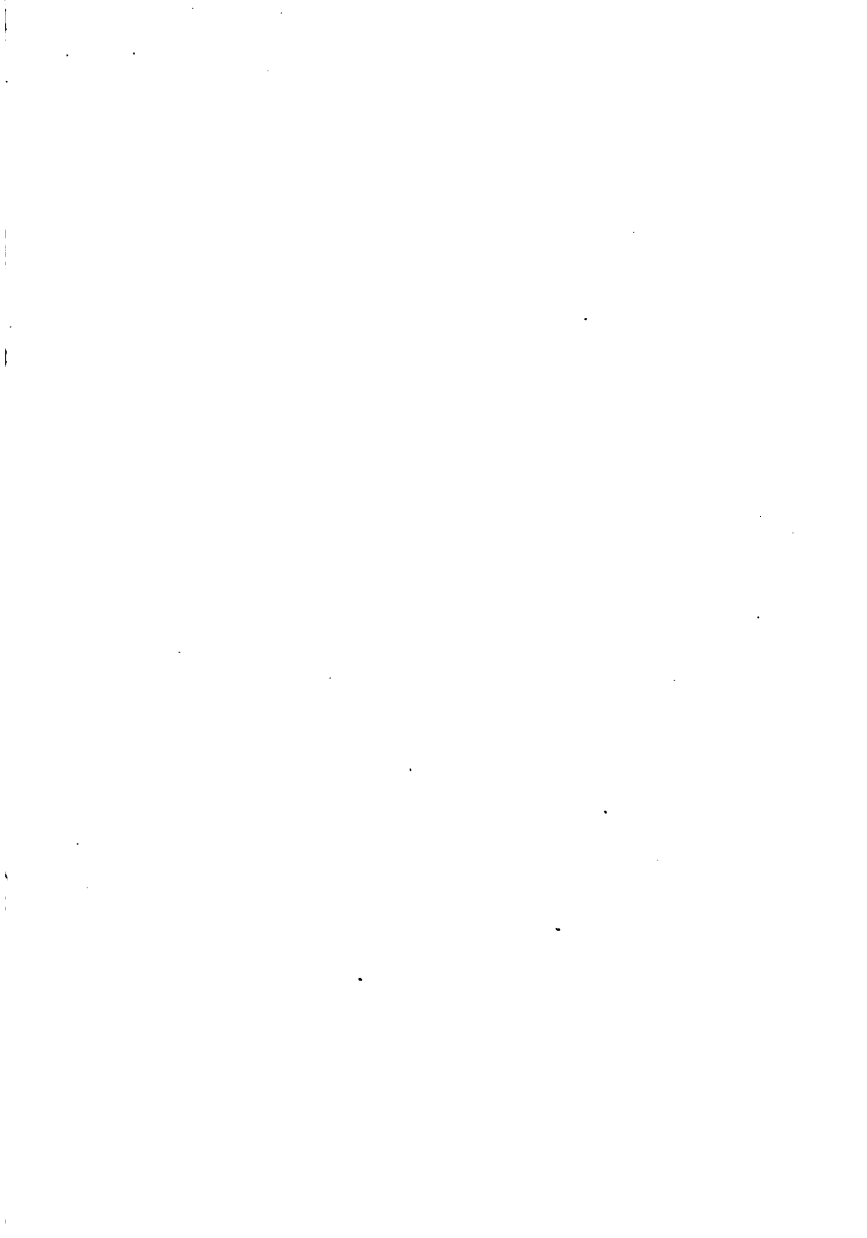
Summer resorts . . . . .	72
Sunshine in rooms . . . . .	14, 52, 54
Towels, separate . . . . .	65
Traps . . . . .	20, 22, 23, 24, 64
Traps, evaporation of water in . . . . .	23
Traps, illustration of . . . . .	21
Typhoid fever . . . . .	8
Ventilation, principles of . . . . .	31-33
Ventilation, objects of . . . . .	33
Ventilation, methods of . . . . .	34, 35, 36
Ventilation of drain-pipes . . . . .	21
Ventilation of the kitchen . . . . .	36
Vent-pipe . . . . .	24, 25
Walls . . . . .	11, 12, 54, 55, 57
Waste-pipe . . . . .	19, 22, 27
Water . . . . .	10, 11, 16, 20, 59, 63, 64, 67, 68, 69, 70
Water-carriage system . . . . .	17
Water-closet . . . . .	19, 22, 23, 25, 64
Water-closets, essentials of sanitary . . . . .	26
Water-seal . . . . .	20, 21, 22, 26
Water-supply . . . . .	16, 63, 64, 68, 72
Well . . . . .	59, 61, 62, 64, 69
Welsbach burner . . . . .	47, 48
Windows . . . . .	11, 12, 14, 32, 32, 33, 34, 35, 36, 54, 56, 64
Woodwork . . . . .	23, 54, 55, 56

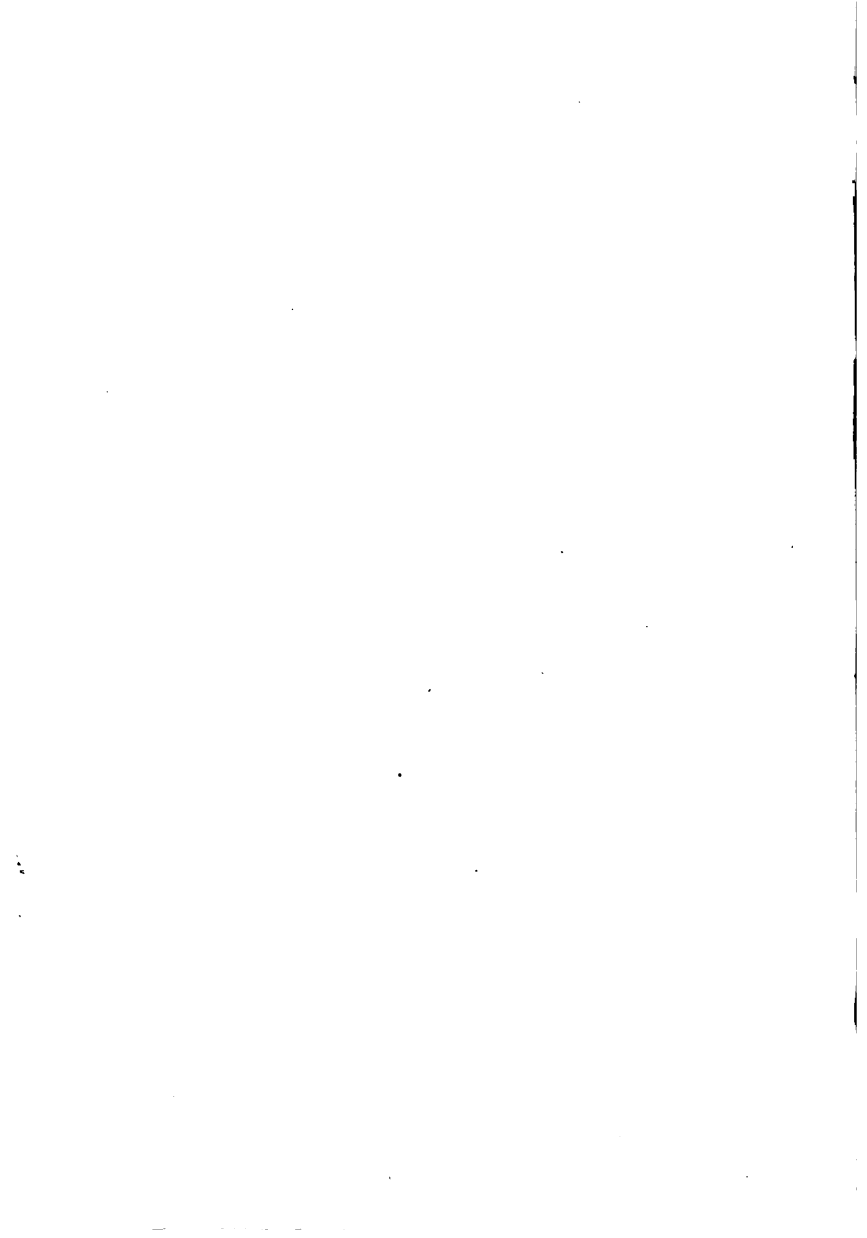


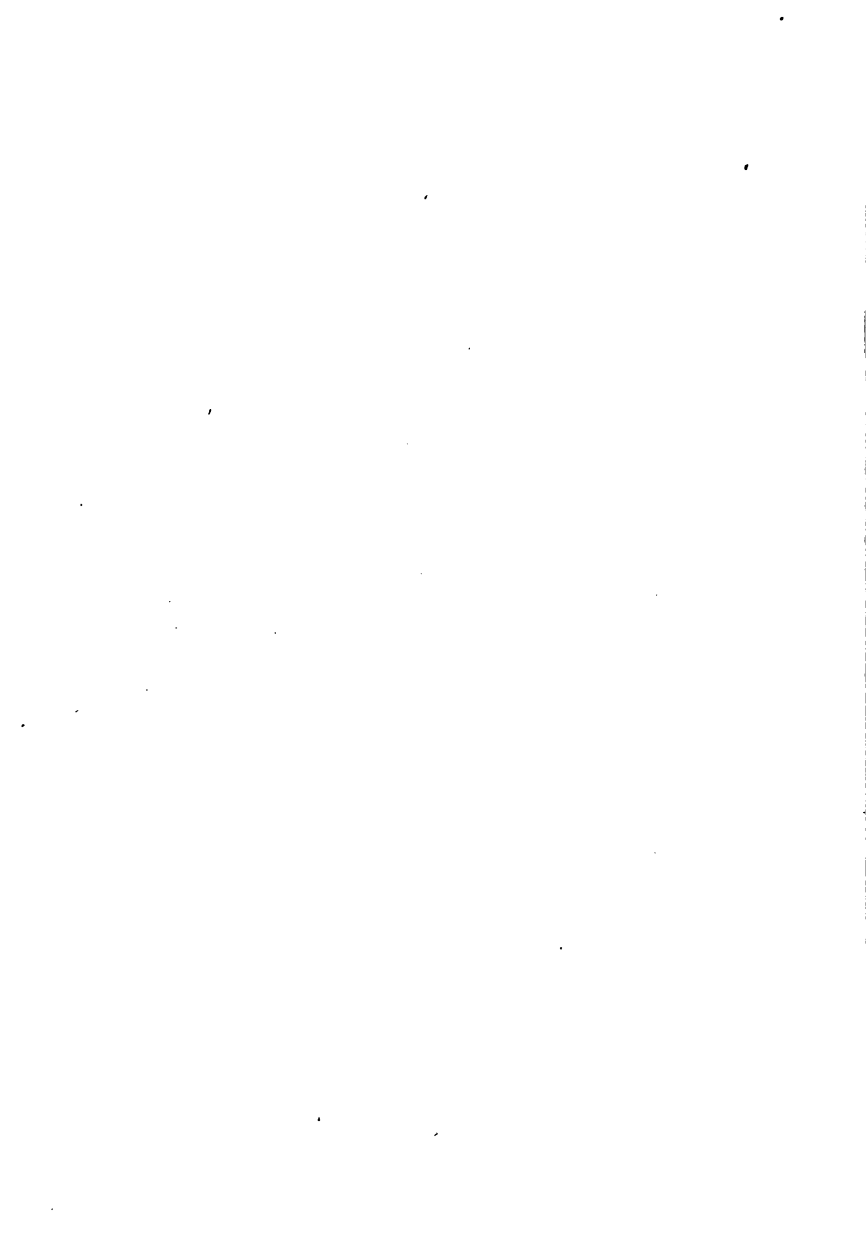


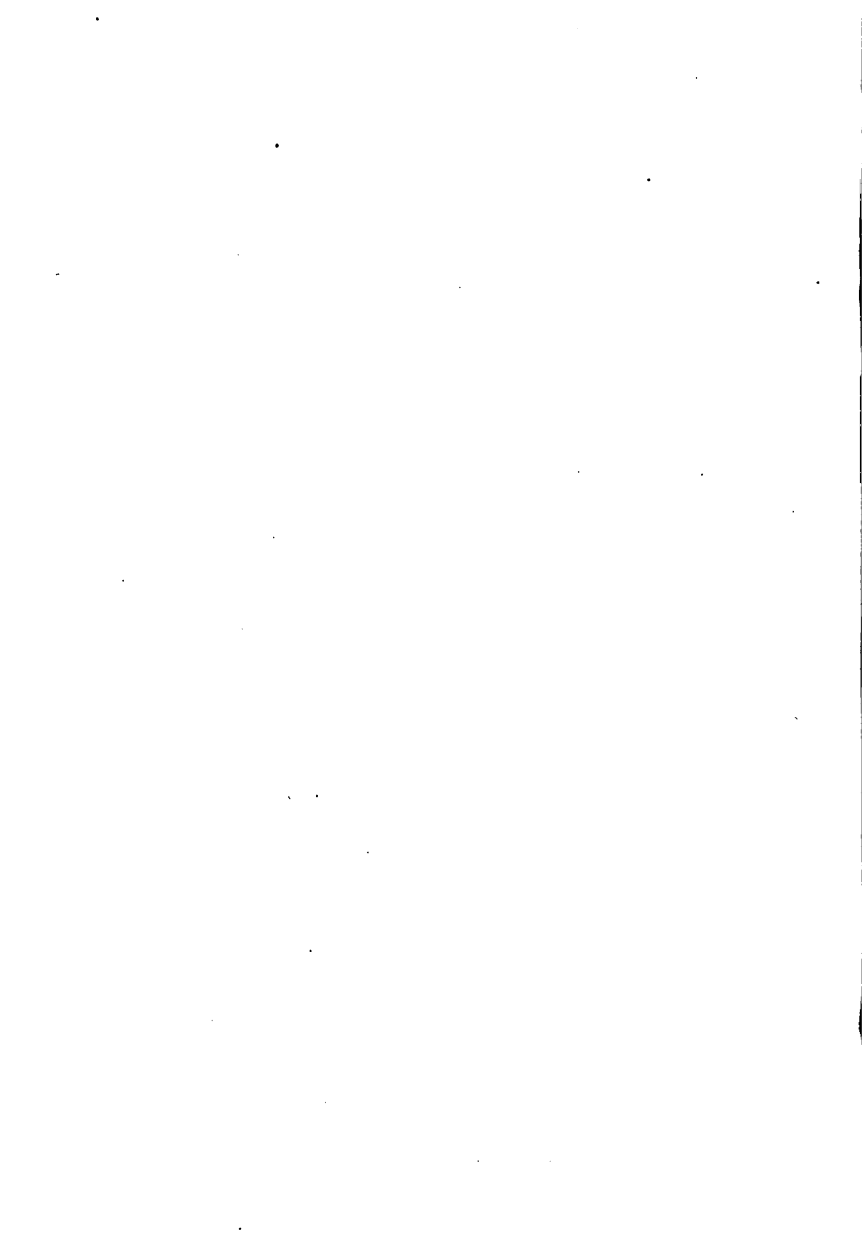












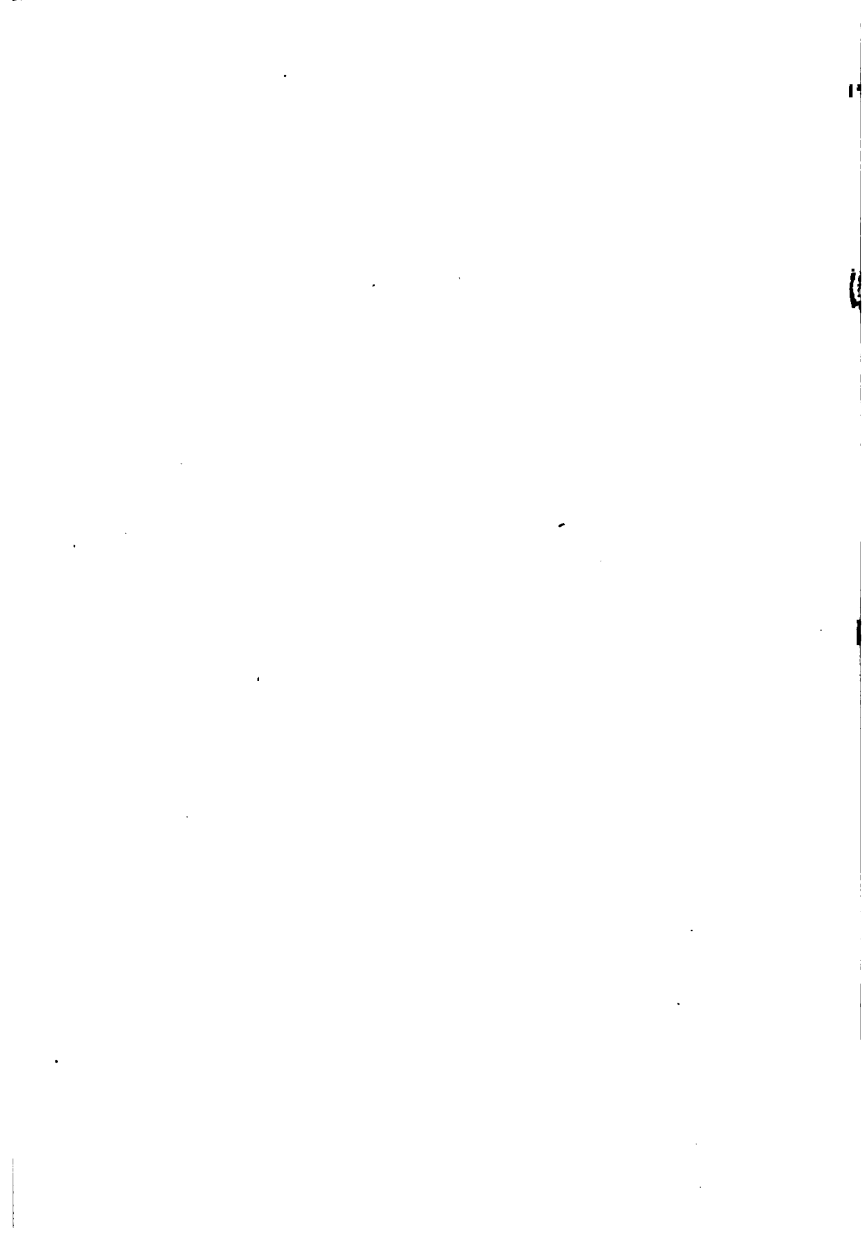




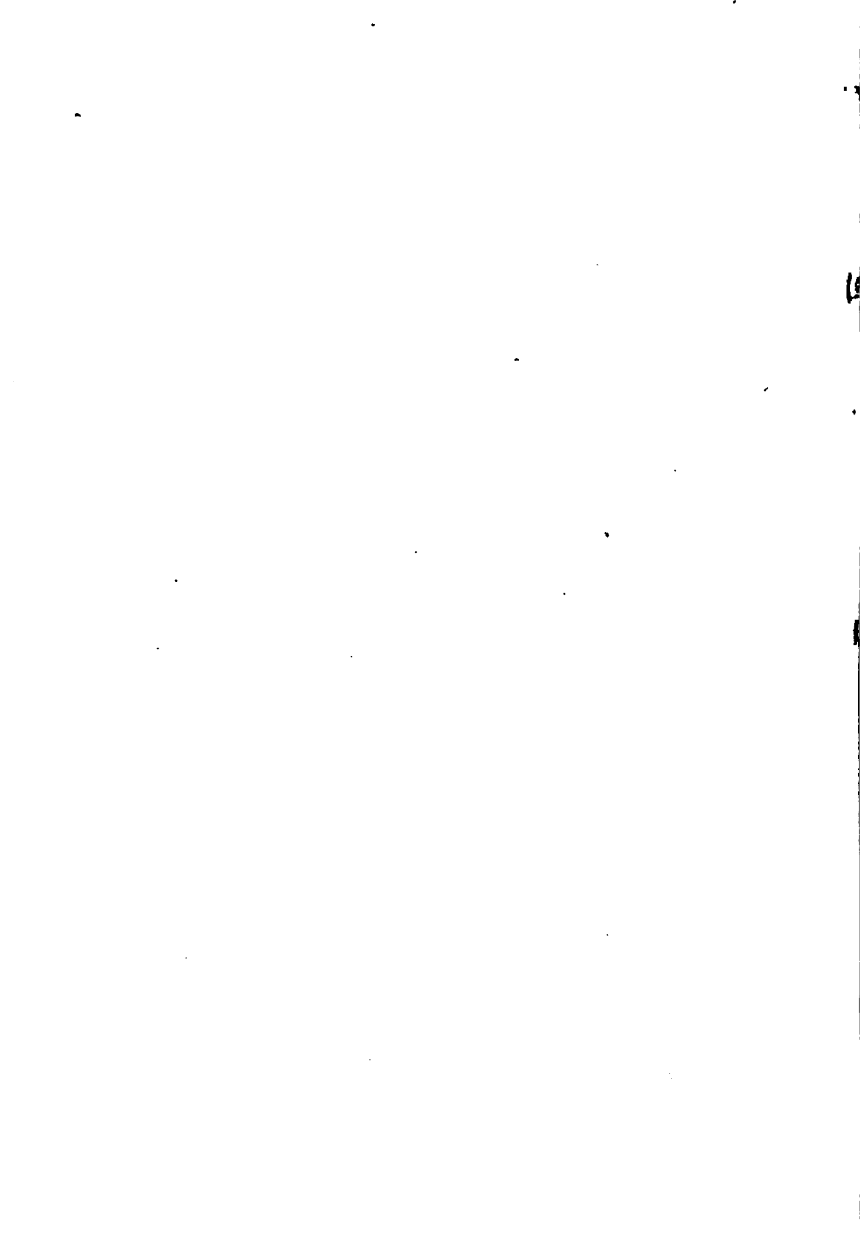






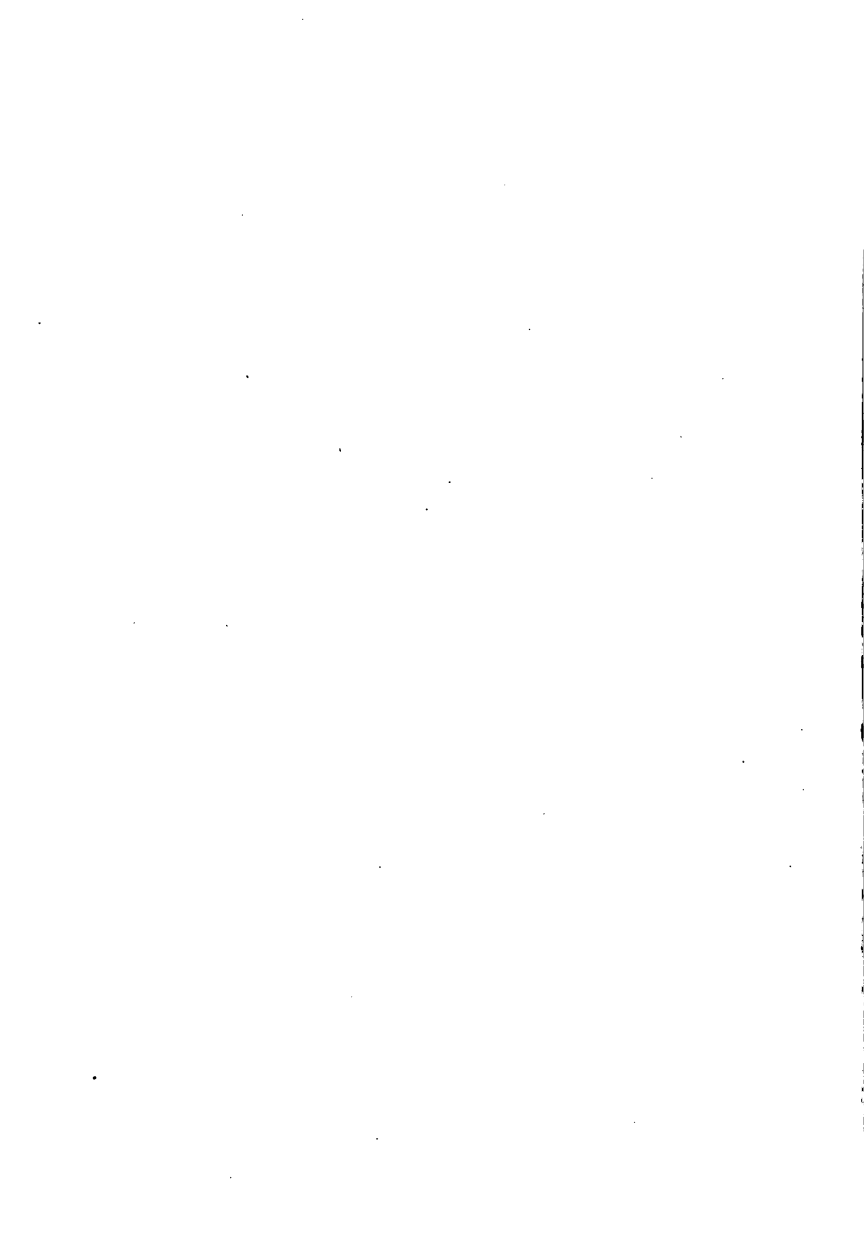


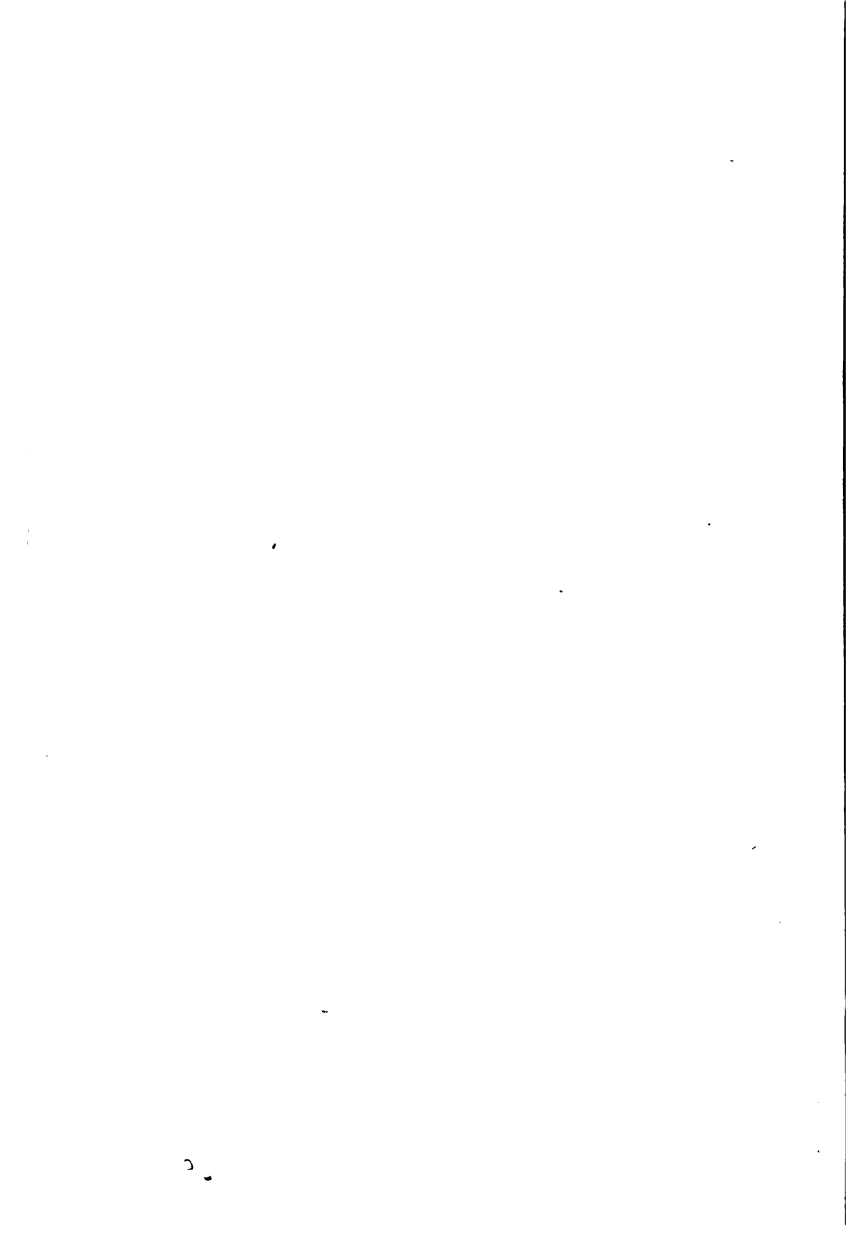


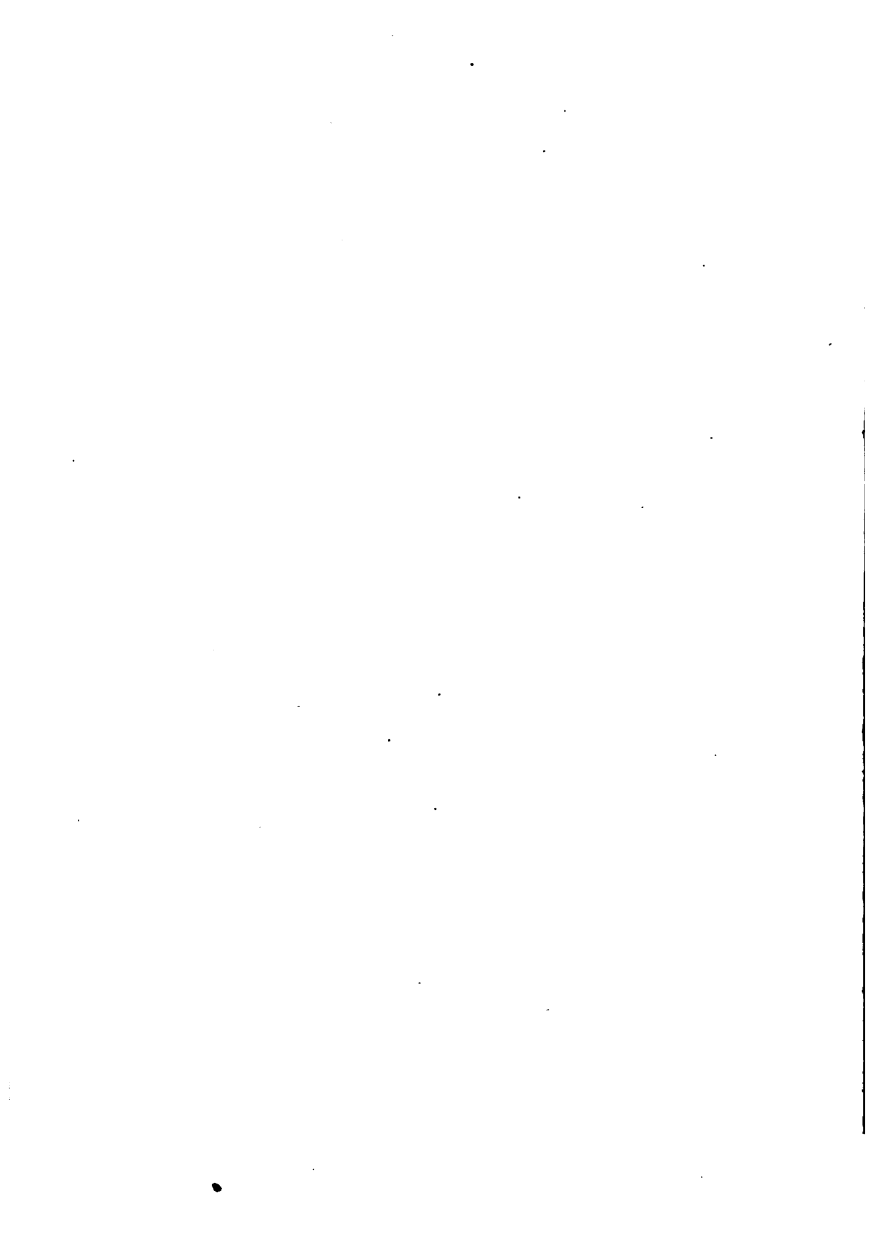


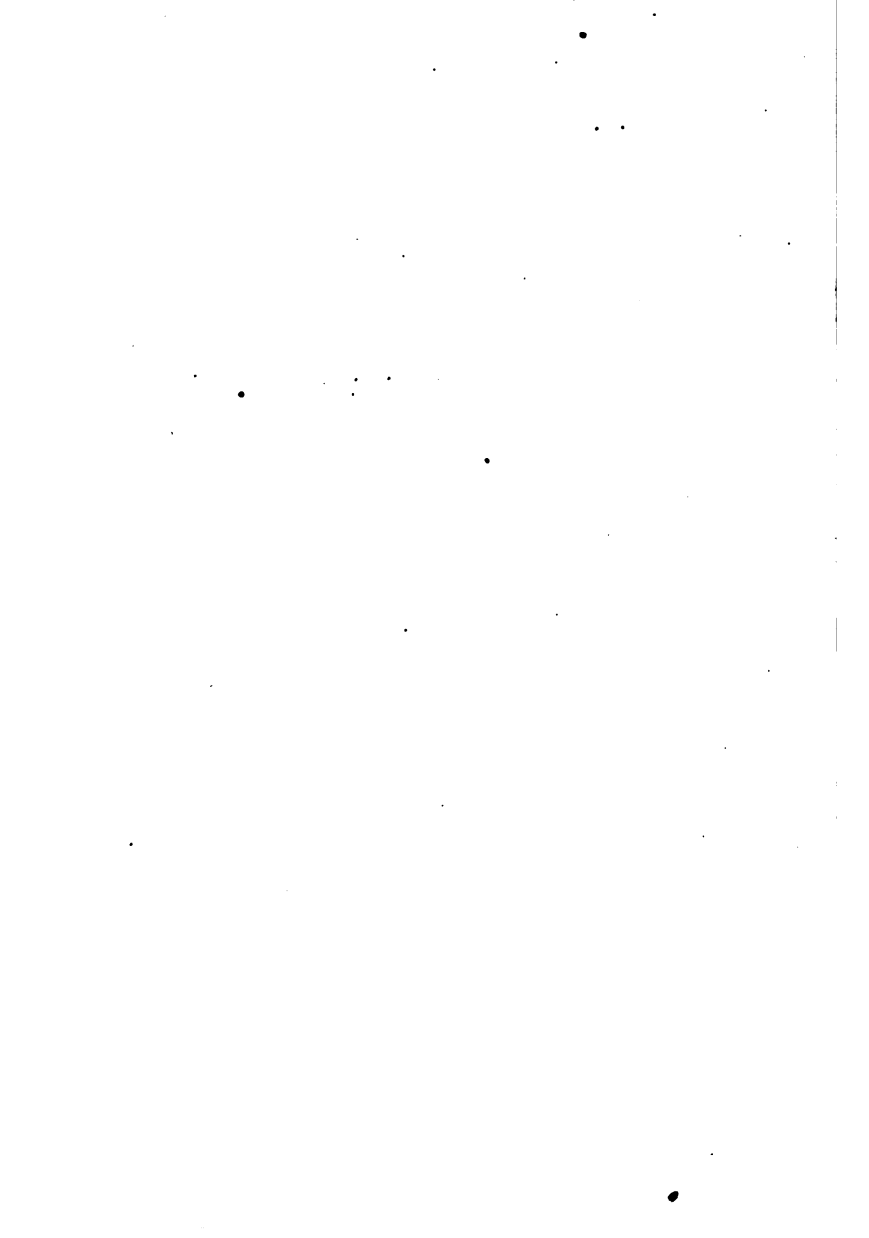


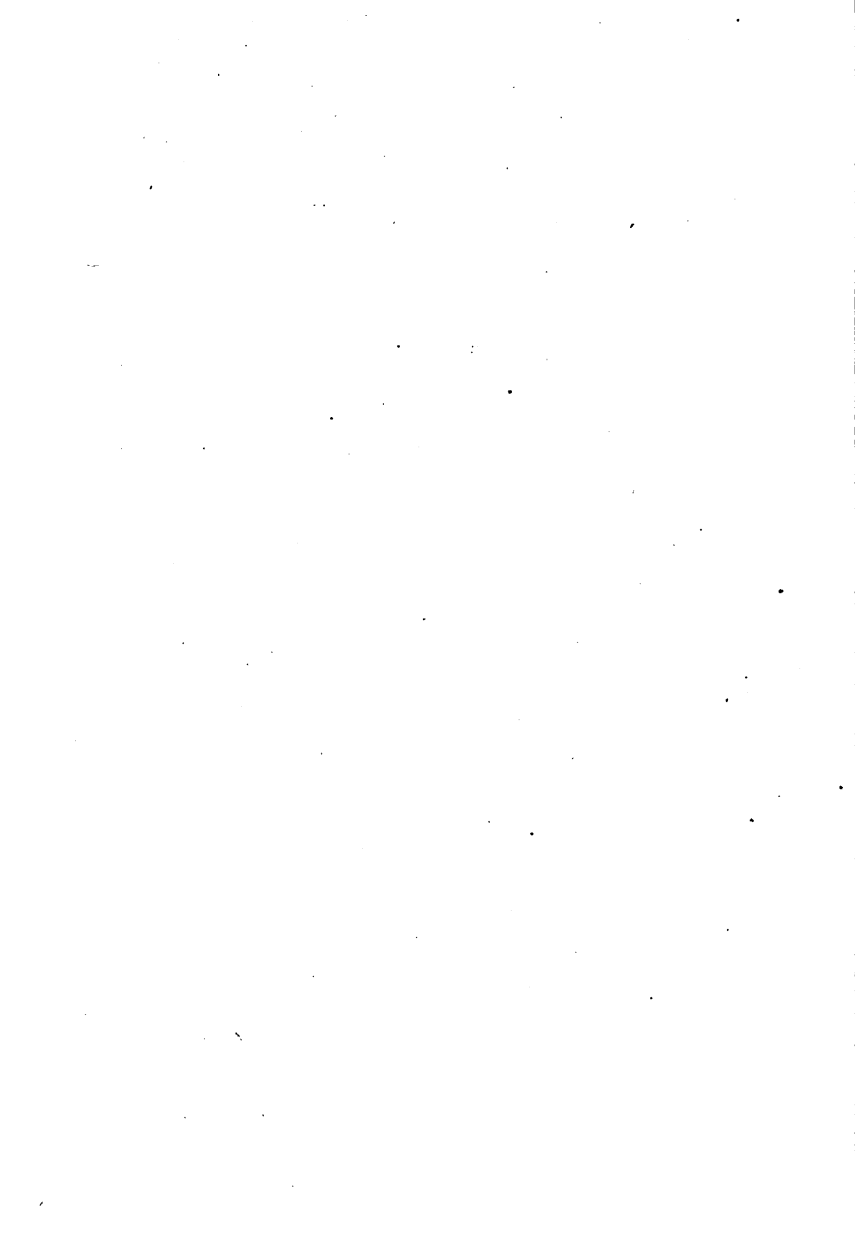












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